FibeAir® 4800

Point-to-Point Wireless
Product Family

Installation and Operation Guide

Version 9.0

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Quick Start Guide

Installation of FA4800 should be carried out only by a qualified technician. If you are familiar with FA4800, use this guide to prepare the units for operation. If you are not familiar with FA4800, please read the Installation and operation Manual carefully.

1. Equipment Required

The following is a list of equipment required for installing a FA4800 link:

- RJ-45 crimp tool (if pre-assembled cable is not used)
- Drill (for wall mounting only)
- IDU and ODU grounding cables
- 13 mm (½″) spanner/wrench
- ODU to IDU cable if not ordered (outdoor class, CAT-5e, 4 twisted pairs)
- Cable ties
- Laptop running Windows 2000 or Windows XP.

2. Before the Installation

1. Verify that all equipment and tools are available.
2. Install the FA4800 software on the laptop; the installation takes several minutes.

   The software installation leaves the FA4800 Manager icon on the desktop.

3. Installing the FA4800 Units

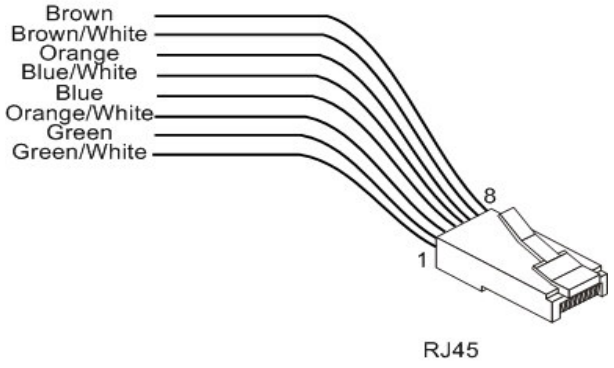
➤ **To install the ODU:**

1. At site A, route the ODU cable from the ODU location (on the roof) to the IDU location (inside the building). The maximum length is 100m.
2. Mount the ODU unit to the mast or wall, using the mounting kit and mounting instructions.

Notes *Do not tightly secure the ODU until the alignment process is complete.*
When installing the ODU is important to check that there are no direct obstructions in front of the ODU between the two link sites.

3. Verify that the ODU mounting brackets are connected to ground.
4. Connect the ODU chassis ground to ground.
5. Connect the RJ-45 connectors to both ends of the cable using the pinout table and diagram below:

IDU RJ-45		Wire Color	Function	ODU RJ-45
1	twisted	White/Green	Ethernet (RxN)	1
2	pair	Green	Ethernet (RxT)	2
3	twisted	White/Orange	Ethernet (TxT)	3
6	pair	Orange	Ethernet (TxN)	6
4	twisted	Blue	Power (+)	4
5	pair	White/Blue	Power (+)	5
7	twisted	White/Brown	Power (–)	7
8	pair	Brown	Power (–)	8



6. Secure the ODU and ground cables to the mast or brackets using cable ties.
7. Repeat the procedure at site B.

➤ **To align the ODU:**

1. Connect power to the site A IDU.

After approximately 20 seconds the ODU beeper starts beeping. This is normal.

2. Verify normal operation of the IDU by the LED indications on the front panel.

Indicator	Color	Status
PWR	Green	ON
IDU-E	Orange Green	ON for short duration during startup ON during normal operation
ODU	Green	ON shows normal operation
AIR I/F	Orange Green	ON for short duration during startup ON shows normal operation
SERVICE	Green	ON shows normal operation OFF when Service is configured for Ethernet only

Warning

Do not stand in front of a live outdoor unit.

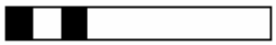
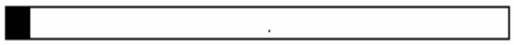
3. Align the site A ODU in the direction of the site B ODU.
4. Connect power to the site B IDU.

   After approximately 20 seconds the ODU beeper starts beeping. This is normal.
5. Verify normal operation of the IDU by the LED indications on the panel.

Indicator	Color	Status
PWR	Green	ON IDU-C only
IDU	Orange Green	ON for short duration during startup ON during normal operation
ODU	Green	ON shows normal operation
AIR I/F	Orange Green	ON for short duration during startup ON shows normal operation
SERVICE	Green	ON shows normal operation OFF when Service is configured for Ethernet only

6. Make an azimuth sweep with the site B ODU of 180 degrees so that the site A ODU position is learned by the site B ODU.
7. Turn the site B ODU slowly back towards the site A direction, listening to the beep sequence until optimal alignment is achieved.

Beeper Sequence ■ **=beeper on** — **=beeper off**	**Description**
[approx. 1s] 	Best Signal so far

	Signal quality increased
	No change in signal
	Signal quality decreased
[approx. 2s] 	No air link

Note *Three beeps and a pause is the best signal*
Two beeps and a pause, signal quality increased
One beep and pause is no signal change
Any other signal detects no signal between ODUs.

8. Secure the site B ODU to the mast/wall.
9. At site A, adjust the ODU slowly while listening to the beeper sequence until the best signal is attained.
10. Secure the site A ODU to the mast/wall.
11. Monitor the link quality for about 15 minutes to verify stability.
12. Connect the management station to one of the two IDUs in the link.
13. Double-click the FA4800 Manager icon to start the application.
14. Click the **Installation** button to open the installation wizard and follow the installation steps.
15. After selection of the radio channel and the link rate (as determined in the Link Budget Calculator utility), verify that the link quality bar in the FA4800 manager is within the green range for TDM service and within the yellow range for Ethernet service.

Note *Achieve the best possible link quality values. In case of radio link loss, verify the ODU alignment, or change the radio channel in both sides of the link. When the radio link resumes, continue the installation process.*

4. Connecting the Power

Warning

Before connecting any cable, the protective earth terminals of the AC/DC adapter must be connected to the protective ground conductor of the mains power cord. If you are using an extension cord (power cable) make sure it is grounded as well.

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

Connecting Power to an IDU-E

Power is supplied to the FA4800 via an external AC/DC converter, which receives power from 100–240 VAC source and converts it to -48 VDC.

➤ **To connect power to the IDU-E:**

1. At site A, connect the 2-pin connector of the AC/DC converter to the 2-pin DC power connector on the IDU rear panel.
2. Connect the AC/DC converter 3-prong plug to a mains outlet.

   The unit turns on automatically upon connection to the mains.
   The green PWR indicator turns on, and the IDU indicator blinks orange for approximately 40 seconds during startup. See *Normal Indicators* section in Chapter 3.
3. After approximately 20 seconds the ODU starts beeping. The beeps continue until the ODUs are aligned and the link set up.
4. Wait for approximately one minute, then repeat for Site B.

Connecting Power to an IDU-C

AC power is supplied to the FA4800 through a standard 3-prong plug.

AC power should be supplied via a 1.5m (5 ft) standard power cable terminated by a standard 3-prong socket. A cable is provided with the unit.

➤ **To connect AC power to an IDU-C:**

1. Connect the power cable socket to the power connector on the FA4800 front panel.
2. Connect the power cable plug to the mains outlet.

   The unit will be turned on automatically upon connection to the mains.

➤ **To connect DC power to an IDU-C**

A special IEC 60320 adapter for -48 VDC or -24 VDC power connection is supplied with the unit.

5. Connecting the User Equipment

➤ **To connect user equipment to the IDU:**

1. Connect the user equipment (such as PBX) to the IDU RJ-45 port designated **Trunk:**
   - On the rear panel of the IDU-E
   - On the front panel of the IDU-C
2. Connect user hub/router or any other compatible device to the IDU RJ-45 port designated **LAN**.
   - On the rear panel of the IDU-E
   - On the front panel of the IDU-C

Notes

- *IDU-C has an integrated LAN switch that provides two 10/100BaseT ports. The Integrated LAN switch does not support spanning tree.*
- *The two LAN ports can be connected to two separate LAN segments.*

Caution Do not connect both LAN ports to the same LAN segment, a loop will be created that will flood the network.

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Chapter 1
Introduction

1.1 Overview

FA4800 is a carrier-class, high capacity, Point-to-Point broadband wireless transmission system. FA4800 combines legacy TDM and Ethernet services over 2.3, 2.4, 4.9 and 5.x GHz license-exempt bands and is suitable for deployment in FCC, ETSI, CN, UK, and CSA-regulated countries. The system provides up to 48 Mbps wireless link and supports ranges of up to 80 km (50 miles) with an external antenna.

Note that for FA4800 systems with earlier ODU hardware versions, contact Ceragon technical support for the relevant manual.

Application

Figure 1-1 illustrates a typical point-to-point application of two FA4800 units.

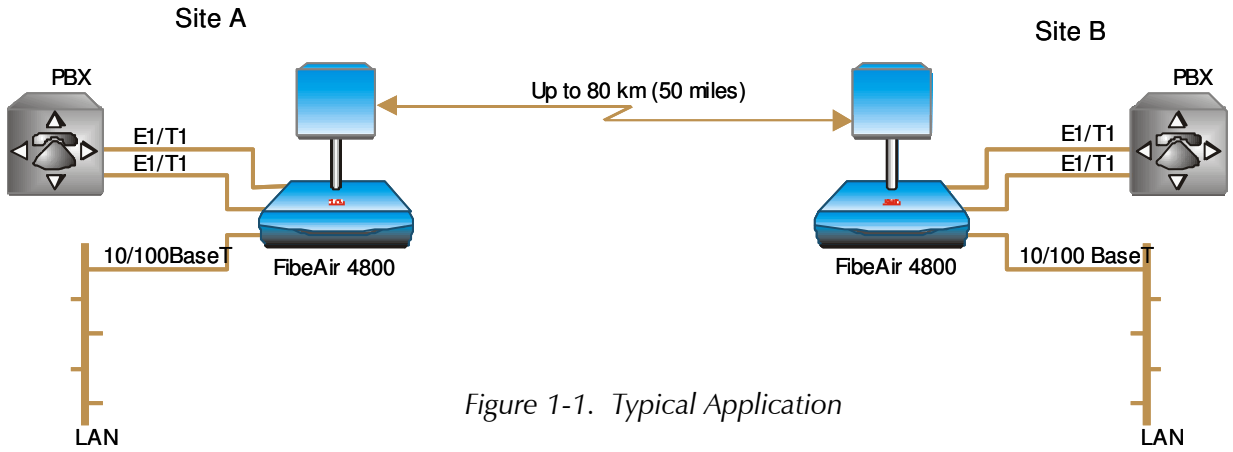


Figure 1-1. Typical Application

Versions

FA4800 is available for operation in several different frequency ranges, with versions for ETSI and FCC regulations.

- F23, 2.300–2.400 GHz
- F24, 2.400–2.4835 GHz
- F49, 4.940–4.990 GHz
- F53, 5.250–5.350 GHz
- F54, 5.470–5.725 GHz
- F58, 5.725–5.850 GHz

- F59, 5.865–5.935 GHz
- F53HP, high-power version, supports a dynamic range of 12 dB transmit power.
- F54E, limited transmit power as specified by the ETSI standard.
- F54-HG, high-gain version for the ETSI regulated markets, to be used with 28 dBi external antenna only.
- F54HP, high-power version, supports high transmit power up to 18 dBm.
- F58/UK, complies with UK DFS/TPC standard.
- AIND, All indoor unit. Available with IDU options 4E1 or 4T1, and ODU options F58/FCC.
  FA4800-AIND integrates the ODU and the IDU-C into a single 19" IDU-C box.
- ACCESS, Ethernet only units powered over the Ethernet via PoE unit. Available in F23, F24, or F58 frequency ranges.

Features

Wireless Link

FA4800 delivers up to 48 Mbps data rate for Ethernet and E1/T1 traffic. The system supports a variety of spectrum bands and can be configured to operate in any channel in the band with a carrier step resolution of 5, 10, or 20 MHz (2.x GHz versions 10 or 20 MHz only).

FA4800 operation complies with ETSI, CSA, CN, UK, and the FCC 47CFR Part 15 and subpart C and E requirements.

FA4800 employs Time Division Duplex (TDD) transmission. This technology simplifies the installation and configuration procedure. There is no need to plan and to allocate separate channels for the uplink and downlink data streams. Operation over 2.4 GHz and 5.x GHz bands is not affected by harsh weather conditions, such as fog, heavy rain etc.

LAN Interface

The FA4800 LAN port provides 10/100BaseT interfaces with autonegotiation and transparent VLAN support. Traffic handling is provided by a MAC-level self-learning bridge.

TDM Interface

The FA4800 TDM interface accepts E1 or T1 traffic, supporting the following:

- Unframed operation (E1 and T1)
- AMI and B8ZS zero suppression (T1).

Advanced Encryption System

FA4800 (version 1.500 and above) ensures user's data security with one of the most sophisticated commercially available combined encryption and authentication techniques, CCM/AES. This technique combines message

authentication (preventing antispoofing and replay protection) with commercial encryption, and complies with the IEEE 802.11i (phase iii) security recommendations.

CCM/AES uses a symmetric 128-bit encryption key (EK), and a nonce, and provides both message encryption and authenticating signature. The nonce mechanism enables the receiver to remember already received genuine messages and reject all replayed messages.

Initial encryption and authentication is based on a user-defined master key (Link Password). While standard Wireless LAN encrypts only the Ethernet Payload, FA4800 encrypts both the source and destination MAC addresses.

Management

FA4800 has full local and remote management capabilities. The user-friendly SNMP-based management tool provides full end-to-end configuration, event log and performance monitoring capabilities.

Diagnostics and Performance Monitoring

FA4800 supports activating local and remote loopbacks on E1/T1 links.

FA4800 constantly monitors the data transmission process, evaluates received signal strength, and signal quality. It also monitors received traffic and frame rate (FPS) for local and remote units.

Automatic Channel Select

Some versions of FA4800 have the Automatic Channel Select feature, which operates via a Dynamic Frequency Selection (DFS) mechanism. This enables coexistence with any radar system that may be active in the area. FA4800 performs channel monitoring and selects the channel with the lowest interference for the transmission.
FA4800 operation complies with ETSI requirements where the ETSI version has been purchased.

Adaptive Rate Modulation (ARA)

FA4800 changes modulation automatically depending on channel characteristics in order to guarantee continuation of service. The adaptive modulation enables the user to maximize Ethernet throughput without degradation of the TDM service quality. When Ethernet only service is used, the adaptive modulation enables improving the Ethernet performance in case of air performance degradation (periodical interference or RSS changes).

In case of interference at one site, there is no need to use a lower modulation at the other site (as in previous versions). In such a case the actual rate changes automatically only at the problematic site, while the second side of the link maintains the highest possible rate (Asymmetric).

Adaptive modulation can be selected in both Installation and Configuration wizards.

Transmit Power Control

The Transmit Power Control (TPC) function, provides the capability of defining the transmit power in order to comply with the ETSI standard requirement of 30 dB maximum. See *Table 4-1* for full details of transmit power control.

Alarm Connector

The IDU-C has two external alarm inputs in the form of dry-contact relays. The Alarm interface is located on the front panel of the IDU-C and is a 9-pin D-type female connector. The user enables or disables each of the alarms and can configure the text that appears in the alarm trap. The ODU sends the alarm within less than a second from actual alarm trigger.

The alarm connector is available as an ordering option for the IDU-E.

Optional External Antenna

FA4800 supports configuration of an external antenna. In this configuration, the outdoor unit is supplied with an N-type connector that connects through a coax cable to the external antenna.

An external antenna can extend the range of the link, and in some cases, may help to reduce environmental interferences. Various external antennas are available for the FA4800 operating frequencies.

For example, an optional flat panel 28 dBi external antenna increases the operation range of FA4800 up to 80 km (50 miles).

1.2 Physical Description

FA4800 system consists of an Outdoor Unit (ODU) and an Indoor Unit (IDU)

Figure 1-2 shows the IDU-E, IDU-C carrier class unit, and an ODU with integrated antenna.

Figure 1-2. FA4800 Units

IDU-E

The front panel of the IDU-E includes five LEDs, which display the status of E1/T1 traffic, wireless link, self-test results, the ODU-to-IDU link, and power status. For a detailed description of the front panel LEDs, see *Chapter 3*.

The rear panel of the IDU includes the connectors for power, WAN, LAN, E1/T1, and the ODU. The wiring specifications are detailed in *Appendix A*. The rear panel LEDs are described in *Chapter 3*.

IDU-C

The IDU-C front panel includes four LEDs that display the status of E1/T1and, wireless link, self-test results, and ODU-to-IDU link. For a detailed description of the front panel LEDs, see *Chapter 3*.

ODU

ODU includes a power connector, which receives -48 VDC, and RJ-45 for Ethernet traffic from the IDU. The ODU is attached to a mast using a special mounting kit, which is supplied with the unit.

The ODU can be used with an integrated antenna, as illustrated in *Figure 1-2*, or with an external antenna. If an external antenna is to be used, then the ODU is supplied fitted with an N-type connector.

1.3 Functional Description

FA4800 system comprises of the following units:

- **Outdoor Unit (ODU)**: An enclosed aluminum frame with a front sealed plastic cover, containing an integrated transceiver with an antenna, RF module, modem and standard interfaces. The ODU stores all the configuration parameters of the FA4800 system. *Figure 1-3* shows the ODU block diagram.
- **Indoor Unit (IDU-E or IDU-C)**: The interface unit between the ODU and the user. It converts 100–240 VAC to -48VDC, and sends it on to the ODU. The IDU does not store any configuration data. Therefore, there is no need for additional configuration of the FA4800 system when replacing an IDU.

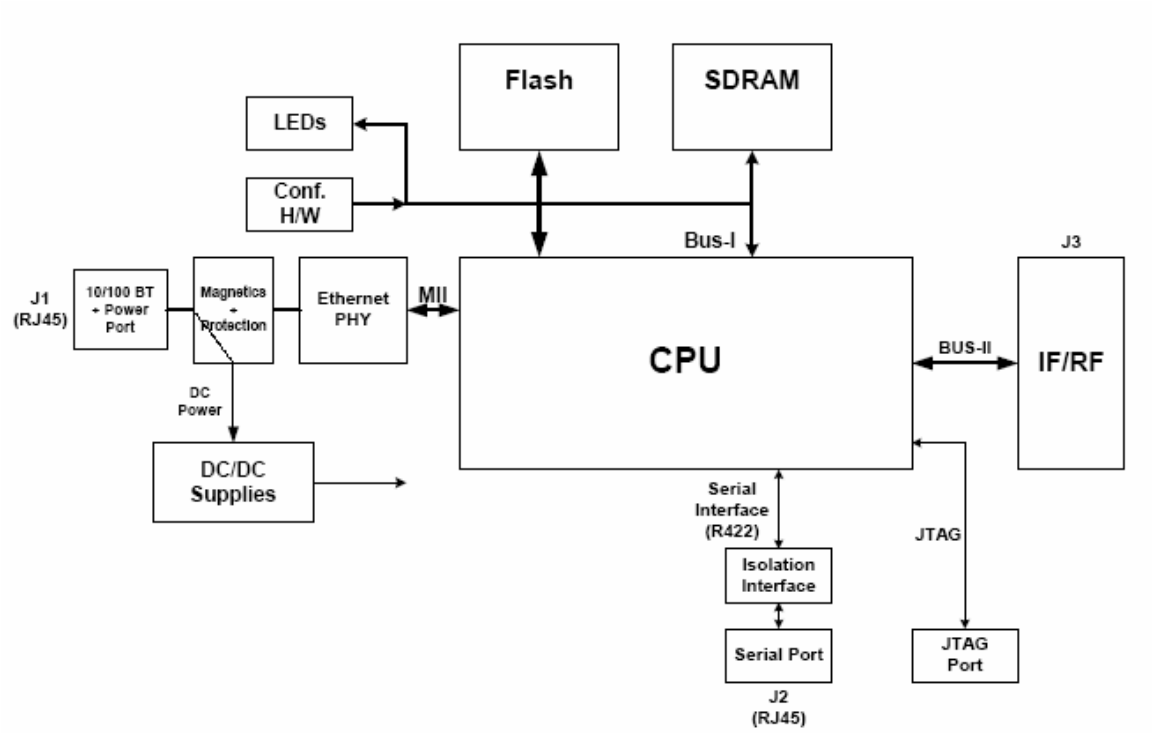


Figure 1-3. ODU Block Diagram

1.4 Technical Specifications

Air Interface	*Technology*	OFDM				
	Duplexing Method	Time Division Duplex (TDD)				
	Capacity	Configurable up to 48 Mbps				
	Modulation	OFDM - BPSK, QPSK, 16QAM, 64QAM				
	Channel Resolution	5/10/20 MHz				
	Transmitter Power	Specification is different per product, for further details refer to the *Link Budget Calculator*				
	Range	Up to 41 km (25.5 miles) Up to 80 km (50 miles) with an external antenna ACCESS versions up to 20 km.				
	Frequency Bands [GHz]	2.300–2.483	4.940–4.990	5.150–5.350	5.470–5.725	5.725–5.850
	Standard	FCC ETSI	FCC	FCC	ETSI	FCC
Antennas	(See Antenna Characteristics in *Appendix E*)					
LAN Interface	*PHY*	Up to 2 × 10/100BaseT, auto-sensing				
	Framing/Coding	IEEE 802.3/U				
	Bridging	Self-learning, up to 2048 MAC addresses				
	Line Impedance	100Ω				
	VLAN Support	Transparent				
	Frame Size	1536 bytes max				
	Connector	RJ-45				
E1 Interface	*Data Rate*	Unframed (transparent) 2.048 MHz (Specification may be different per ordering option)				
	Line Interface	HDB3				
	Connector	RJ-45				
	No. of Ports	IDU-E: 1 or 2 IDU-C: 4				

T1 Interface	*Data Rate*	Unframed (transparent) 1.544 MHz (Specification may be different per ordering option)	
	Zero Suppression	AMI, B8ZS	
	Connector	RJ-45	
	No. Of Ports	IDU-E: 1 or 2 IDU-C: 4	
Indicators	*PWR (green)*	Power status (IDU-E only)	
	IDU (green)	IDU-C status	
	ODU (green/red)	ODU-to-IDU link status	
	AIR I/F (green/red)	Air Interface status	
	SERVICE (green/red)	E1/T1 signal status	
Power	*Source*	IDU-E: 100–240 VAC via external AC/DC converter IDU-C: 100–240 VAC via AC cable -48 VDC (-42 to –60 VDC) 24 VDC	
	Power Received by the ODU	-48 VDC	
	Power Consumption	ODU plus IDU-E – 10W max ODU plus IDU-C – 14W max	
	Connector	IDU-E 2-pin IDU-C AC – 3-pin IEC connector DC – 3-pin terminal block	
Alarm Connector	*Connector*	DB-9 female	
	Electrical Characteristics	Dry Contact, 30V/2A Max input current, 0.01A at 0.5W (R=5K)	
Physical	***Outdoor Unit (ODU)***		With integrated antenna
	Height	24.5 cm / 9.3 in	30.5 cm / 12 in
	Width	13.5 cm / 5.13 in	30.5 cm / 12 in
	Depth	4.0 cm / 1.57 in	5.8 cm / 2.3 in
	Weight	1.0 kg / 2.2 lb	1.5 kg / 3.3 lb
	Indoor Unit	**IDU-E**	**IDU-C**
	Height	4.5 cm / 1.7 in (1U)	4.5 cm / 1.7 in (1U)
	Width	23.5 cm / 9.3 in	29 cm / 11.5 in
	Depth	16.5 cm / 6.7 in	43 cm / 17.7 in
	Weight	0.5 kg / 1.1 lb	1.5 kg / 3.3 lb
Environment	***Outdoor Unit (ODU)***		
	Enclosure	All-weather case	
	Temperature	-35 to 60°C/-31 to 140°F	

Indoor Unit (IDU-E and IDU-C)

Temperature	-0 to 50°C/32 to 122°F
Humidity	Up to 90%, non-condensing

Chapter 2
Installation and Setup

2.1 Introduction

This section describes the installation, alignment, and setup procedures for a FA4800 system.

After installing the hardware and establishing a link, refer to *Chapter 3* for operation instructions and *Chapter 4* for configuration instructions.

In case a problem is encountered, refer to *Chapter 5* for test and diagnostic instructions.

Warning

Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved.
Always observe standard safety precautions during installation, operation, and maintenance of this product.

2.2 Site Requirements and Prerequisites

For the IDU units, allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature should be –45 to 60°C/–49 to 140°F (ODU), or –5 to 45°C/23 to 113°F (IDU) at a relative humidity of up to 90%, non-condensing.

2.3 Package Contents

The FA4800 packages include the following items:

- ODU package contains:
  - ODU
  - Mast/Wall mounting kit plus mounting instructions
  - FA4800 Manager installation CD
  - Spare RJ-45 connector
- IDU package contains:
  - IDU
  - 110V/220V adapter
  - IDU wall-mounting drilling template
  - Self adhesive label showing the IDU LED operation
  - Spare RJ-45 connector

Or

- IDU-E Package Contains:
  - IDU-E
  - Self adhesive label showing the MAC address and the alternative community string KEY. Keep this label safe.
  - For AC model, 110/240 VAC with 3-pin terminal block connector (green)
  - For DC model, 3-prong connector cable
  - Standard 1-U, 19" carrier rack
  - Spare RJ-45 connector
- External antenna (if ordered)
- ODU/IDU cable at length ordered (optional)
- Technical documentation CD

2.4 Equipment Required

The following is a list of the equipment required for installing the FA4800 hardware.

- RJ-45 crimp tool (if pre-assembled ODU/IDU cable is not used)
- Drill (for wall mounting only)
- IDU and ODU grounding cable
- 13 mm (½″) spanner/wrench
- ODU to IDU cable if not ordered (Outdoor class, CAT-5e, 4 twisted pairs)
- Cable ties
- Laptop running Windows 2000 or Windows XP.

2.5 Installation Sequence

The FA4800 system installation is achieved by following the steps listed below:

1. Installing ODUs at both sites of the link.
2. Assembling the ODU cable and connecting ODU to IDU at both sites.
3. Connecting the power.
4. Installing the management program on the network management station.
5. Aligning the ODUs.
6. Use the Link Budget Calculator Application
7. Running the Installation wizard from the management program.
8. Connecting user equipment to the local and remote IDUs.

Figure 2-1 illustrates a typical installation of FA4800 with an external antenna.

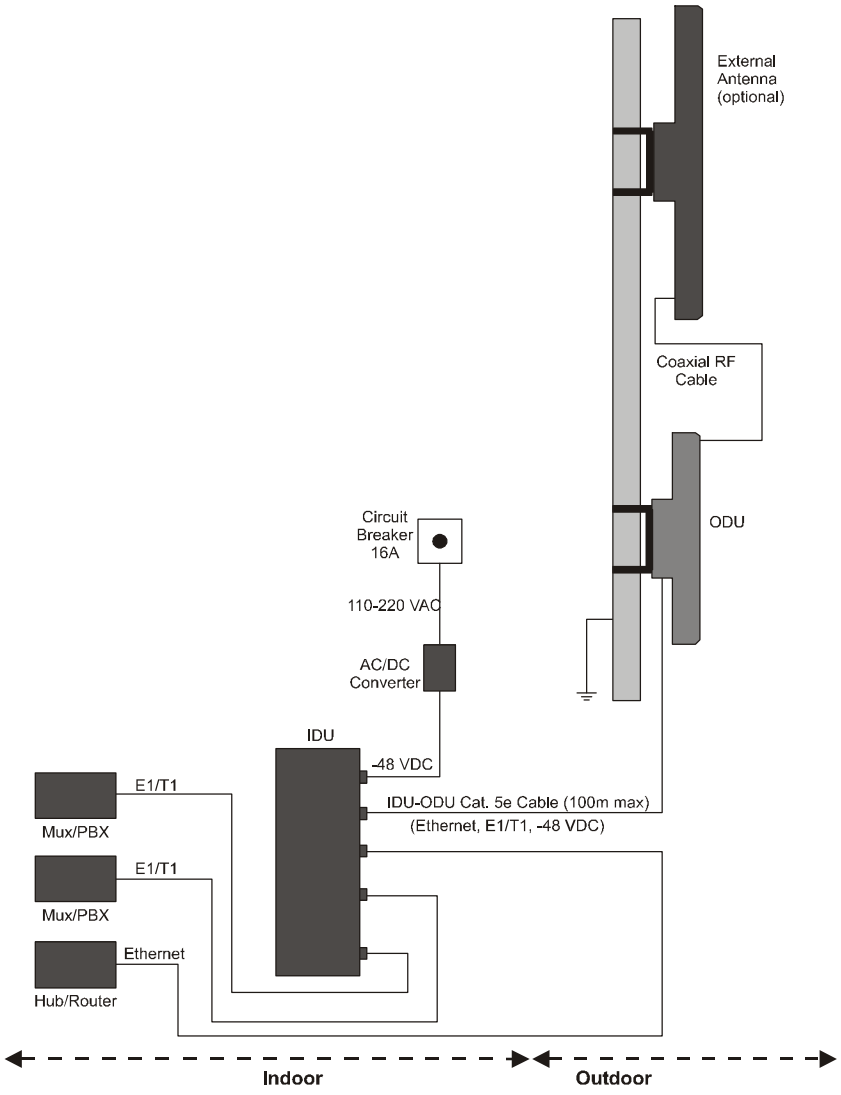


Figure 2-1. Typical Installation Diagram

2.6 Mounting the ODU

The ODU is the transmitting and receiving element of the FA4800 system. The ODU can be mounted on a mast or a wall. In both installations, the supplied mounting kit is used to secure the ODU. *Appendix B* describes the mast/wall installation instructions.

A FA4800 link operates in pairs of two FA4800 systems with the same configuration. Both systems must be installed, and the antennas of the outdoor units must be aligned for maximum throughput.

Warning

Prior to connecting cables to the ODU, the protective earth terminal (screw) of the ODU must be connected to an external protective ground conductor or to a grounded mast.
Only a qualified person using the proper safety equipment should climb the antenna mast. Only trained professional installers should be used when installing or dismantling ODUs and masts.

➤ **To mount the ODU:**

1. Verify that the ODU mounting brackets are properly grounded.
2. Assemble the ODU unit onto the mast or wall. Refer to *Appendix B* for the ODU mounting instructions.
3. Connect the ground cable to the chassis point on the ODU.
4. Attach the ODU cable to the RJ-45 connector. Refer to *Appendix A* for the connector pinout.
5. Secure the cables to the mast or brackets using UV-rated cable ties.
6. Repeat the procedure at the remote site.

Note

Do not tightly secure the ODU to its mounting brackets until the alignment process of the antenna is complete.
When installing the ODU, check that there are no direct obstructions in front of the ODU or interference from man-made obstacles.

2.7 Connecting the ODU to the IDU

The ODU cable conducts all the user traffic between the IDU and the ODU. The ODU cable also provides -48 VDC supply to the ODU. The maximum length for one leg of the ODU cable is 100m (328 ft) in accordance with 10/100BaseT standards.

ODU cable is supplied pre-assembled with RJ-45 connectors, at the length specified when ordering. If the ODU cable was not ordered, use Cat. 5e shielded cable. Wiring specifications are given in *Appendix A*.

➤ **To connect the ODU to the IDU**

1. Route the cable from the ODU location into the building.
2. Secure the cable along its path.
3. Connect the ODU cable to the RJ-45 connector on the IDU designated ODU or WAN. *Figure 2-2* illustrates a typical IDU rear panel. *Figure 2-3* illustrates a typical IDU-E front panel. There may be differences in the panels of depending on the versions of the IDU.

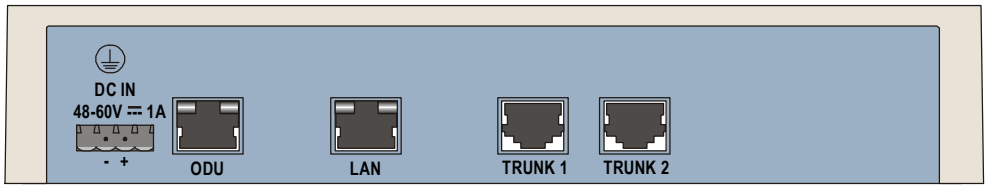


Figure 2-2. Typical IDU Rear Panel

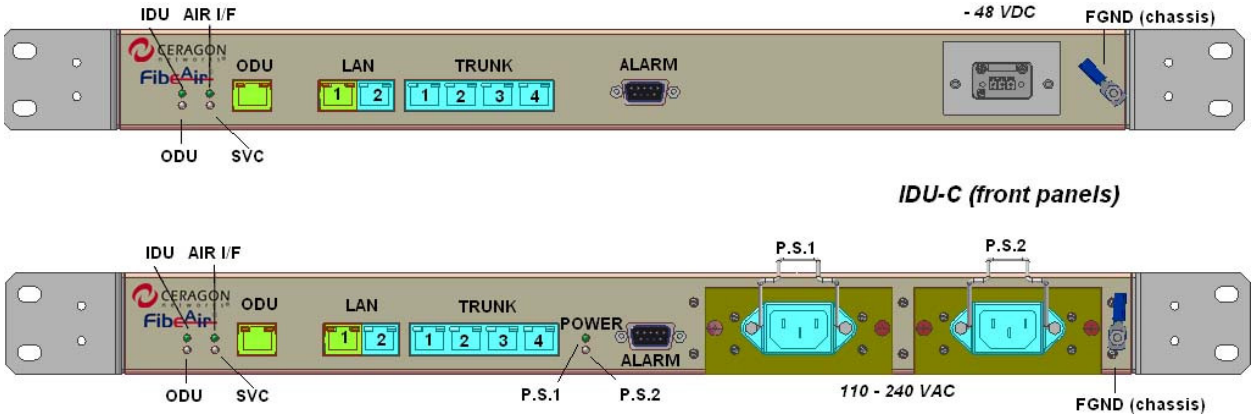


Figure 2-3. Typical IDU-C Front Panels

Figure 2-4. FA4800-AIND All Indoor Radio Unit

Note *The IDU and IDU-C panels may be fitted with different connector combinations depending on the model ordered.*

2.8 Installing FA4800 Management Software

The FA4800 management application is distributed on CD-ROM as an executable file. The application has the following PC requirements:

- Memory: 128 MB RAM
- Disk: 1 GB free hard disk space
- Processor: Pentium 3 or higher
- Network: 10/100BaseT NIC
- Graphics: Card and monitor that support 1024×768 screen resolution with 16 bit color
- Operating system: Windows 2000/XP
- Microsoft Explorer 5.01 or later.

➤ **To install the FA4800 management program:**

1. Insert the CD-ROM into your CD-ROM drive.
2. The autorun feature starts to install the software automatically. If the installation does not start automatically, run setup.exe.
3. Follow the on-screen instructions of the installation wizard to complete setup of the FA4800 Management program in the desired location.

Any PC running the FA4800 management application can be used to configure FA4800 units.

2.9 Connecting the Power

Warning

Before connecting any cable, the protective earth terminals of the AC/DC adapter must be connected to the protective ground conductor of the mains power cord. If you are using an extension cord (power cable) make sure it is grounded as well.
Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.

Connecting Power to an IDU-E

Power is supplied to the FA4800 IDU-E via an external AC/DC converter, which receives power from a 100–240 VAC source and converts it to -48 VDC.

➤ **To connect power to the IDUs:**

1. At site A, connect the 2-pin connector of the AC/DC converter to the 2-pin DC power connector on the IDU rear panel.
2. Connect the AC/DC converter 3-prong plug to a mains outlet.

The unit turns on automatically upon connection to the mains.
The green PWR indicator turns on, and the IDU indicator blinks orange for approximately 40 seconds during startup. See *Normal Indicators* section in Chapter 3.

After approximately 20 seconds the ODU starts beeping. The beeps continue until the ODUs are aligned and the link set up.

3. Wait for approximately one minute, then repeat for Site B.

Connecting Power to an IDU-C

AC power is supplied to the FA4800 IDU-C through a standard 3-prong plug.

AC power should be supplied via a 1.5m (5 ft) standard power cable terminated by a standard 3-prong socket. A cable is provided with the unit.

➤ **To connect AC power to an IDU-C:**

1. Connect the power cable socket to the power connector on the FA4800 front panel.
2. Connect the power cable plug to the mains outlet.

   The unit turns on automatically upon connection to the mains.

➤ **To connect DC power to an IDU-C**

A special IEC 60320 adapter for-48 VDC power connection is supplied with the unit.

2.10 Starting the FA4800 Manager Software

➤ **To start the FA4800 Manager:**

1. Connect the management station to the LAN.
2. Double-click the FA4800 Manager icon on the desktop, or click **Start > Programs > FA4800 Manager**.

   The Login dialog box appears.

Figure 2-5. Login Screen

3. Select the suitable option:
   - Select Local Connection (Broadcast), if user is connected directly to the IDU LAN port.
   - Enter IP address (of the ODU)
     Default address: **10.0.0.120**
     The Subnet mask is **255.0.0.0.**

Note *The actual IP address is defined during link configuration (see Defining the Management Addresses).*

4. Enter the password

   Default password – ***admin*** (see the section on *Changing the Management Password*)

5. Click the Read only check box if entering the system as a Read only user.
6. If you are a user with Read-Write permission, click **Options** to enter the community options.

   FA4800 is protected with Community passwords. A user may be defined with read-only permission or with read-write permission. See the section *Changing Community Values* for more detail.

- If using the system for the first time, enter **netman** (default) in the read-only and read-write fields.
- If community values have previously been defined, enter them in the read-only or read-write communities.
- If you are a user with read-only permission, click the Read Only Mode check box.

The FA4800 Manager main screen is displayed

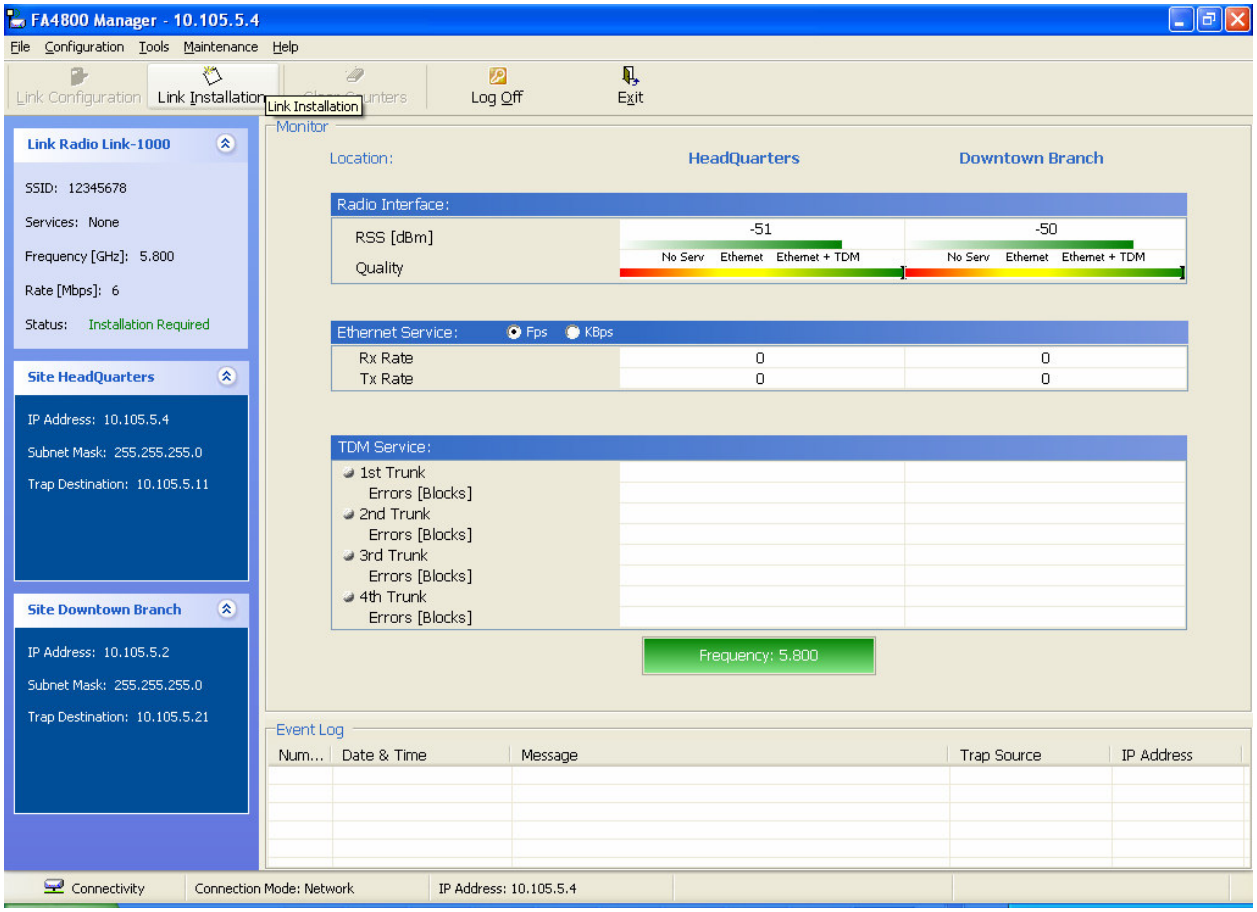

FA4800 Manager - 10.105.5.4
File Configuration Tools Maintenance Help
Link Configuration
Link Installation
Link Installation
Log Off
Exit
Link Radio Link-1000
SSID: 12345678
Services: None
Frequency [GHz]: 5.800
Rate [Mbps]: 6
Status: Installation Required
Site HeadQuarters
IP Address: 10.105.5.4
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.5.11
Site Downtown Branch
IP Address: 10.105.5.2
Subnet Mask: 255.255.255.0
Trap Destination: 10.105.5.21
Monitor
Location:
HeadQuarters
Downtown Branch
Radio Interface:
RSS [dBm]
Quality
-51
-50
No Serv Ethernet Ethernet + TDM
No Serv Ethernet Ethernet + TDM
Ethernet Service:
Fps
KBps
Rx Rate
Tx Rate
0
0
0
0
TDM Service:
1st Trunk
Errors [Blocks]
2nd Trunk
Errors [Blocks]
3rd Trunk
Errors [Blocks]
4th Trunk
Errors [Blocks]
Frequency: 5.800
Event Log
Num...
Date & Time
Message
Trap Source
IP Address
Connectivity
Connection Mode: Network
IP Address: 10.105.5.4

Figure 2-

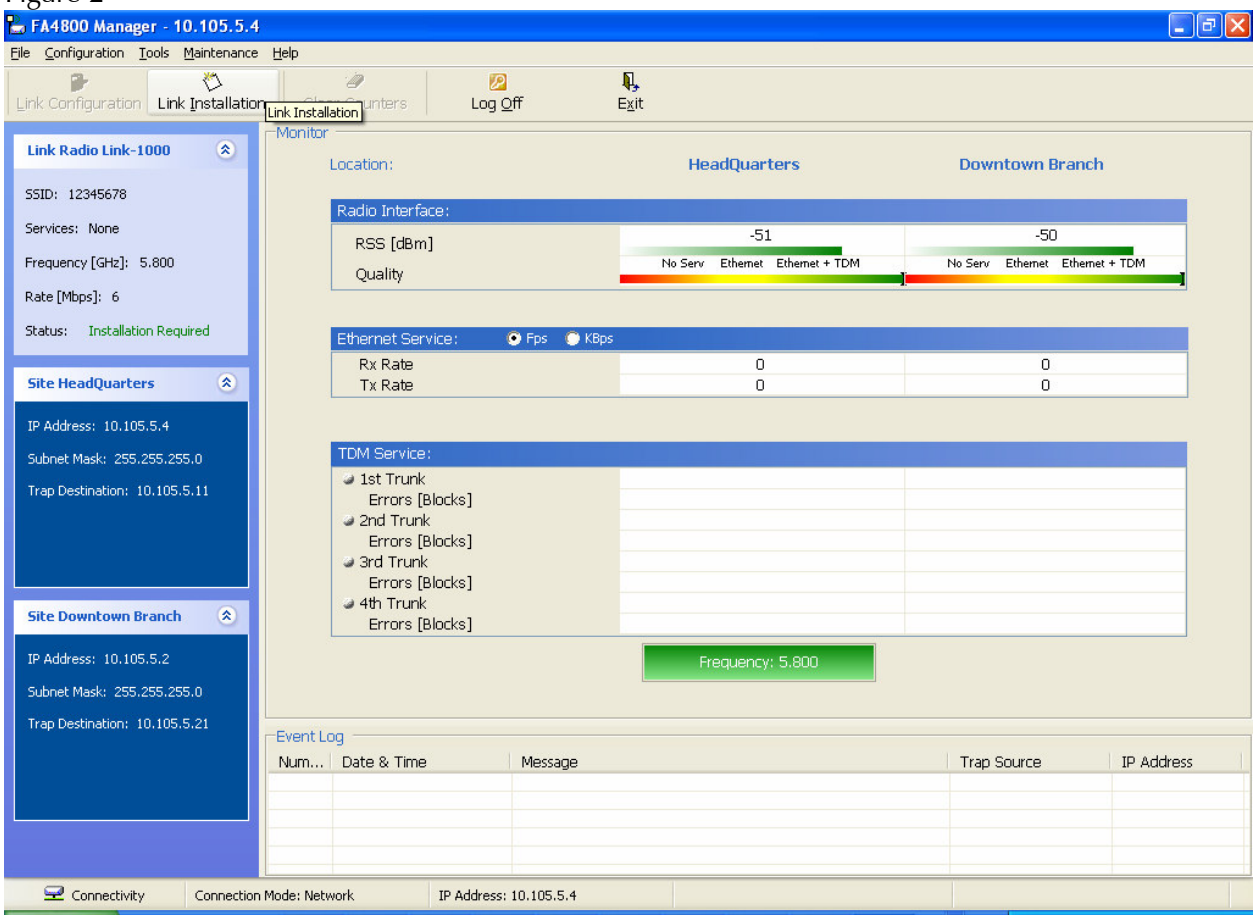


Figure 2-6. FA4800 Manager Main Screen

2.11 Over the Air Connection Indication

During the login the Manager reports on over the air connection.

Note *Over the Air connection to remote unit is not recommended*

- Select the relevant option for your login requirements.

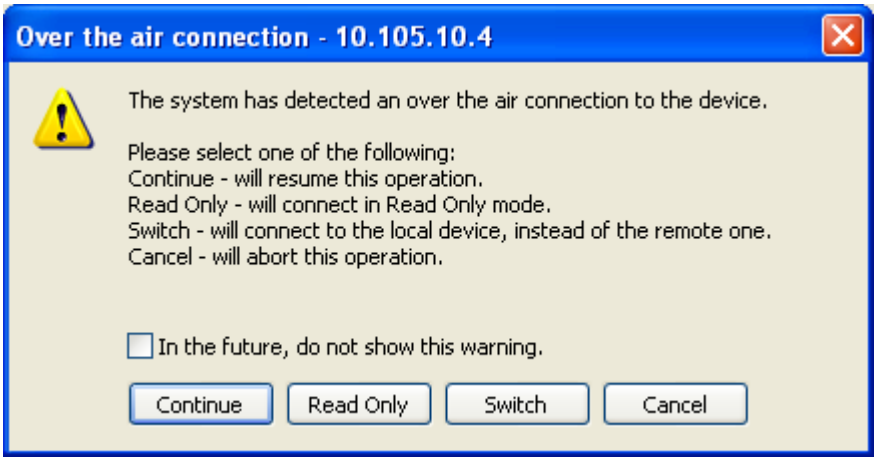

Over the air connection - 10.105.10.4
The system has detected an over the air connection to the device.
Please select one of the following:
Continue - will resume this operation.
Read Only - will connect in Read Only mode.
Switch - will connect to the local device, instead of the remote one.
Cancel - will abort this operation.
In the future, do not show this warning.
Continue
Read Only
Switch
Cancel

Figure 2-7. Over the Air Connection

2.12 Aligning ODUs with the Beeper

Perform the FA4800 ODU alignment using the beepers located inside the ODUs. The beeper facility is not suitable for aligning the All Indoor Units, AIND. To align an AIND system see Appendix D for alternative alignment methods.

To speed up the installation time, alignment of a FA4800 Link can be performed by two teams simultaneously, at site A and at site B.

➤ **To align the ODUs via ODU Beeper:**

1. Verify that power is connected to the IDUs at both sites.

Warning

Do not stand in front of a live ODU.

2. The ODU starts beeping 20 seconds after power up, and continues beeping until the ODUs are aligned, and the link is established.
3. Verify normal operation of the IDU by the LED indications on the front panel. (See *Normal Indications*.)
4. Coarsely align the site B ODU in the direction of the site A ODU.
5. Make an azimuth sweep of 180 degrees with the site A ODU. So that the strongest signal from site B can be learnt.

6. Slowly turning the site A ODU back towards the position of Site B, listen to the beeps until the best signal is reached. See *Figure 2-* for the beeper signals.

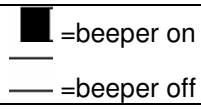
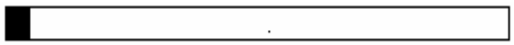
Beeper Sequence 	**Description**
[approx. 1s]	Best Signal so far
	Signal quality increased
	No change in signal
	Signal quality decreased
[approx. 2s] 	No air link

Figure 2-8. Beeper Sequence for ODU Alignment

Note

Three beeps and a pause is the best signal
Two beeps and a pause, signal quality increased
One beep and pause is no signal change
Any other signal detects no signal between ODUs.

7. Secure the site A ODU to the mast/wall.
8. At site B, adjust the ODU slowly whilst listening to the beeper sequence until the best signal is attained.
9. Secure the site B ODU to the mast/wall.
10. Monitor the link quality for about 15 minutes to verify stability.

2.13 Calculating the Air Interface Rate

The Air Interface rate is the data transmission rate from one site to the other, over the wireless FA4800 interface. Use the *Link Budget Calculator Utility* in order to calculate the optimal air interface rate and the expected performance of the link operating at the user's requirements.

The ARA, Adaptive Rate Modulation feature performs this task automatically and ensures that the transmission rate is set to maximum whilst the link quality throughput is maintained.

➤ **To open the Link Budget Calculator Utility**

1. Click **Help** on the Menu Bar.
2. Select Link Budget Calculator.

   The Link Budget Calculator Utility opens. See *Appendix C* for full instructions how to use the Link Budget Calculator Utility.

2.14 Installing the Link

During the installation procedure, the definition of all parameters is automatically applied to both sides of the link.

➤ **To install the link:**

1. Verify that the management station is properly connected to the same LAN as the IDU, and the FA4800 Manager application is running.
2. In the toolbar, click the **Link Installation** button.

   The Installation wizard opens.

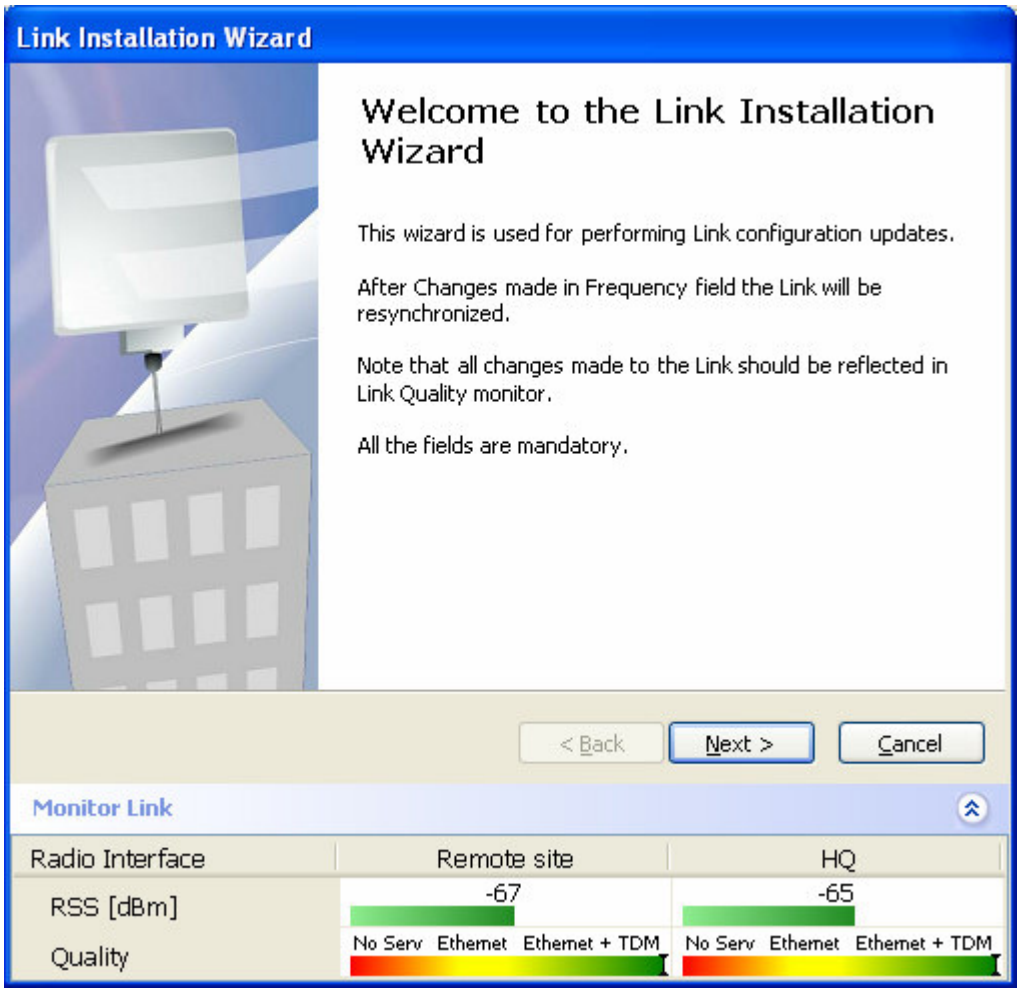

Link Installation Wizard
Welcome to the Link Installation Wizard
This wizard is used for performing Link configuration updates.
After Changes made in Frequency field the Link will be resynchronized.
Note that all changes made to the Link should be reflected in Link Quality monitor.
All the fields are mandatory.
< Back
Next >
Cancel
Monitor Link
Radio Interface
Remote site
HQ
RSS [dBm]
-67
-65
Quality
No Serv Ethernet Ethernet + TDM
No Serv Ethernet Ethernet + TDM

Figure 2-9. Link Installation Wizard

3. Click **Next** to proceed with the installation procedure.

   A message box is displayed.

4. On the first installation the default link password must be changed. Click **OK** in the message box.

   The Change Link Password dialog box opens.

Note *Use the Hide Characters check box for maximum security.*

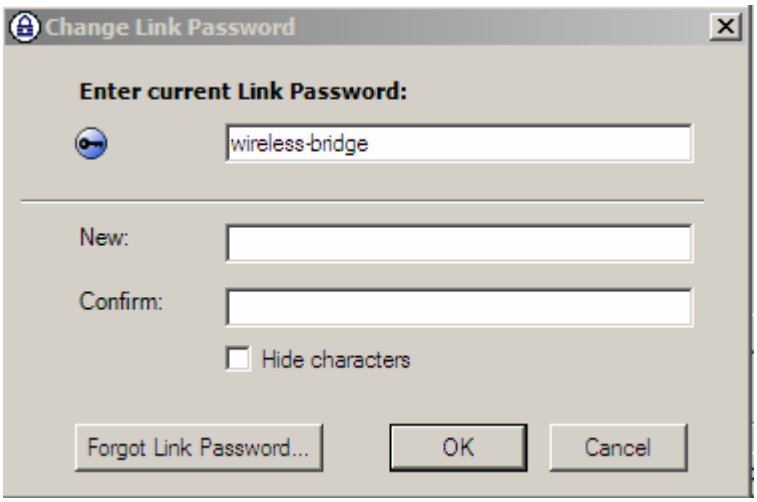


Figure 2-10. Change Link Password dialog box

5. Enter the default link password **wireless-bridge**.
6. Enter a new password.
7. Retype the new password in the confirm field.
8. Click **OK**.
9. Click **Yes** when asked if you want to change the link password.
10. Click **OK** at the successful message.

    The system dialog box opens.

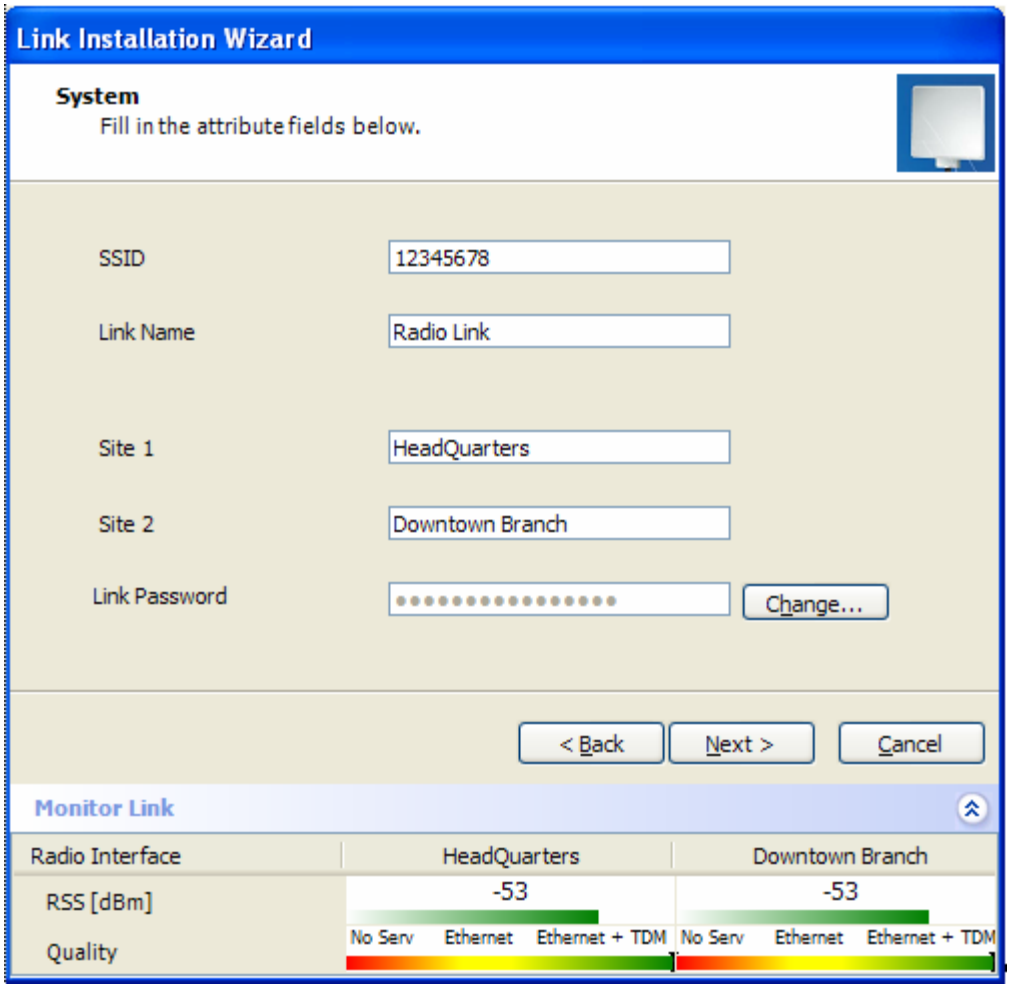


Figure 2-11. Installation Wizard, System dialog box

11. Enter a SSID (System ID). The SSID must include at least eight alphanumeric characters. Up to 24 characters are allowed.

Note *Both sides of a link must have the same SSID number for data transmission to take place.*

12. Enter a Link Name for the link identification.
13. Enter a name for site 1.
14. Enter a name for site 2.
15. Enter the Link Password (version 1.400 and after). See *Changing the Link Password* for details on the Link Password.

Note *It the Link Password is incorrect a link will be established but configuration cannot be performed and no services will be available.*
A new link password may be obtained from Technical Support or use the alternative password supplied with the product. See Changing the Link Password for more details.

16. Click **Next**.

The *Channel Setting* dialog box appears. This dialog box may be different according to the version that you have purchased.

Selecting Channels

FA4800 later than version 1.300 have a feature called Automatic Channel Select, which allows you to define several alternative frequency channels if interference is detected on the channel in use.

- For FA4800 with the Automatic Channel Select feature see *FA4800 with Automatic Channel Select* (applies to versions after 1.300).
- For FA4800 5.4 GHz ETSI version see *FA4800 5.4 GHz ETSI Version*.

FA4800 with Automatic Channel Select

Automatic Channel Select gives FA4800 the ability to change frequency channels automatically if interference is detected on the current operating channel.

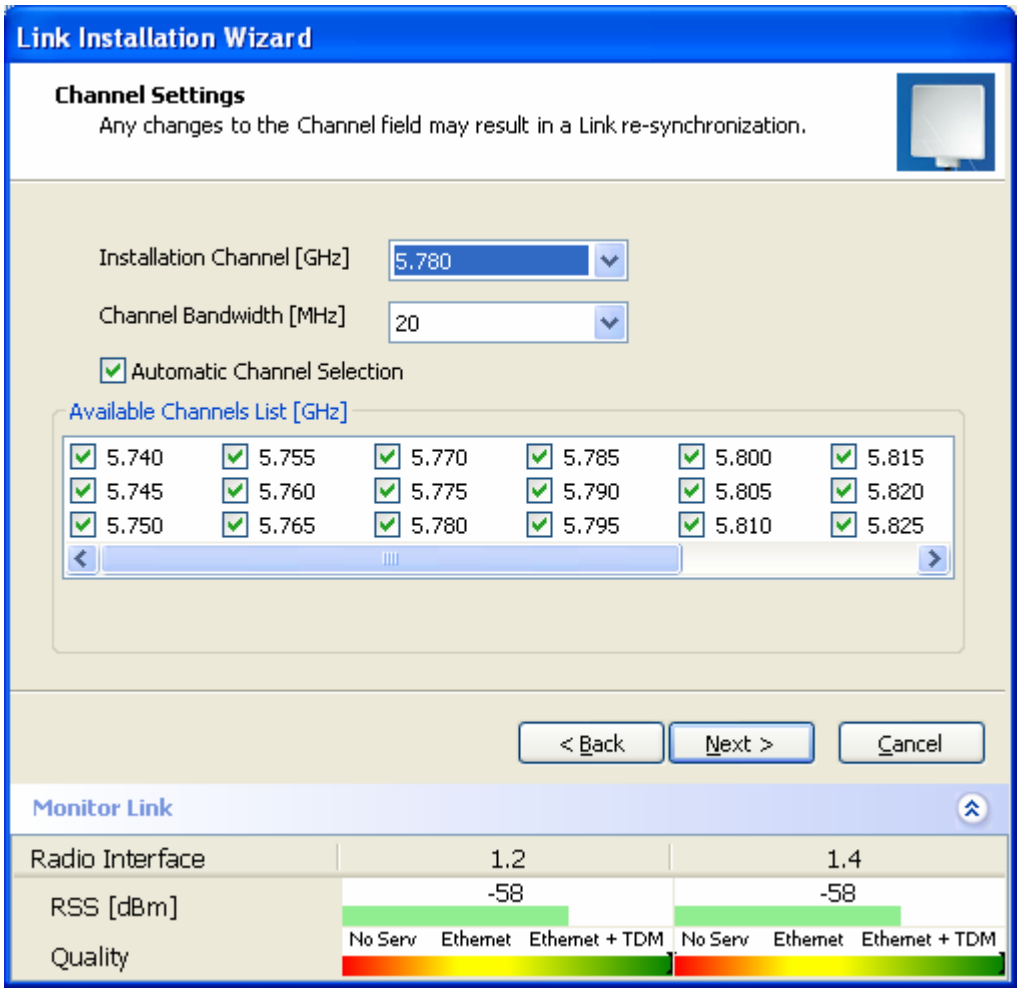


Figure 2-12. Channel Select dialog box - Automatic Channel Select

17. Select the main frequency from the Installation Channel menu.
18. Select the required Channel Bandwidth 5, 10, or 20 MHz.

Note

F2.x GHz versions operate at 10 or 20 MHz steps only.

19. Click the check box if Automatic Channel Selection is required.
20. Click the check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

    Selecting a new channel causes the system quality to change. The quality bar shows the adjustment until the system finds the best quality link.
21. If you are not satisfied with the channel that is selected automatically, click Reselect Channel.

    A new channel will be selected from one of the Available Channels that has been defined.
22. Click **Next.**

    The Evaluating Rate box appears. The optimum rate for the link is selected.

    The Service Parameters dialog box opens.

FA4800 5.4 GHz ETSI Version

In accordance with ETSI, if FA4800 detects Radar interference it changes the frequency channel automatically. This feature is termed Dynamic Frequency Selection (DFS). In this version, the Automatic Channel Selection is selected by default and a minimum of two channels must be defined as available.

1. Select the main frequency from the Operating Channel menu.
2. Select the Bandwidth required.

Note *Automatic Channel Selection is selected by default.*

3. Click at least two check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

Note *Installation will not continue until at least two channels are defined.*

   Selecting a new channel causes the system quality to change. The quality bar shows the adjustment until the system finds the best quality link.

   Any channel selected is evaluated for 60 seconds; therefore this selection process may take a few minutes.
4. If you are not satisfied with the channel that is selected automatically, click Reselect Channel.

   A new channel will be selected from one of the Available Channels that has been defined.
5. Click **Next.**

   The Evaluating Rate box appears. The optimum rate for the link is selected.

   The Service Parameters dialog box opens.

Selecting the Service Parameters

The user defines the type of service required, Ethernet Only or Ethernet with TDM. The bandwidth remaining available for Ethernet if TDM services are required is shown in the dialog box.

Note *FA4800 ACCESS versions are Ethernet Only.*

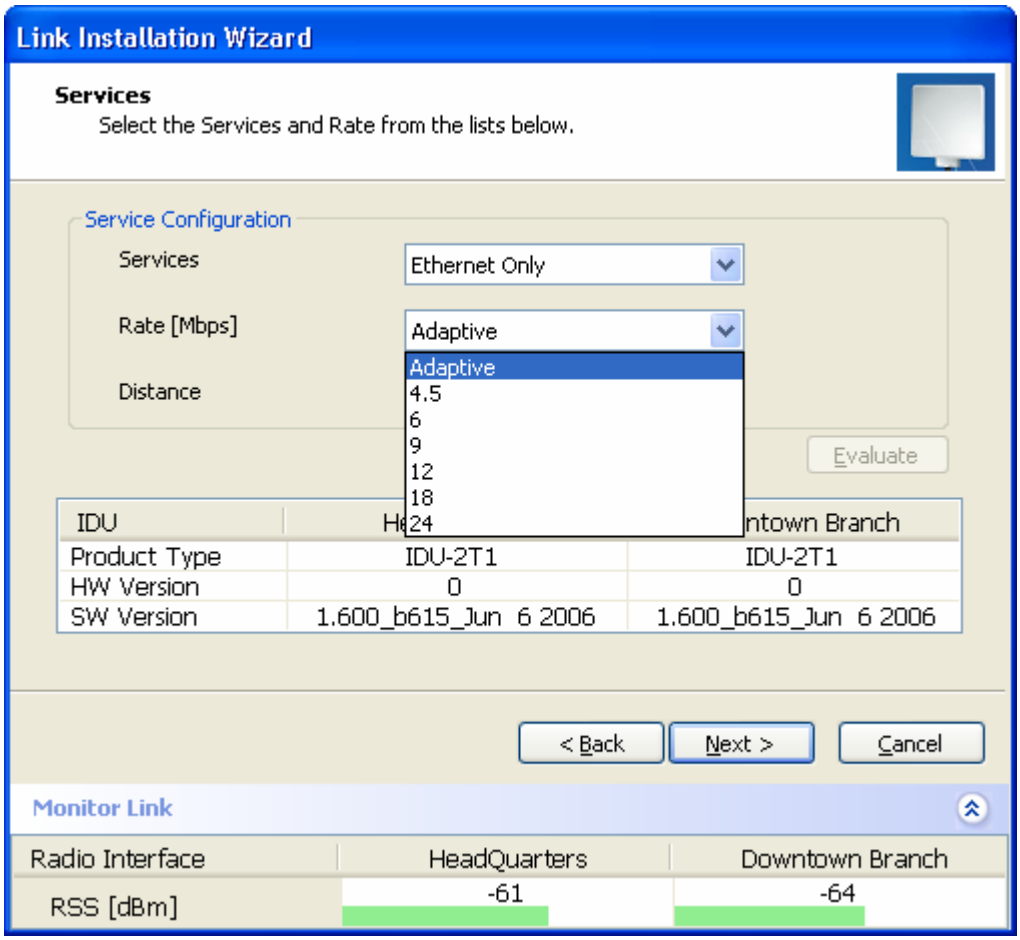


Figure 2-13. Installation Wizard, Services dialog box

➤ **To select the services:**

1. In the Service dialog box, select one of the following:
   - E1/T1 – E1/T1 data and Ethernet data.
     The Ethernet BW field shows the remaining bandwidth in Mbps available for Ethernet. The available bandwidth depends on the number of E1/T1 ports selected.
   - Ethernet Only
2. Select the required transmission rate.
   If Adaptive is selected FA4800 constantly monitors and adjusts the transmission rate to ensure maximum throughput for the link at the highest quality. ACCESS versions are preset to adaptive and the rate selection is disabled.
3. Click **Next**.

   If TDM services were selected, then the TDM parameters dialog box appears, (see Figure 2-15).
4. The optimum transmission rate for the selected services is evaluated. *Table 2-1* shows the rates used by FA4800. ACCESS versions do not have TDM services, they operate at a rate of 2 Mbps.

If Ethernet Only was selected, then the Finish screen appears (see Figure 2-16) showing a summary of the link configuration, the alignment is complete.

Table 2-1. Rates per Bandwidth

Modulation/FEC	5 MHz	10 MHz	20 MHz
BPSK / ¾	2.25 Mbps	4.5 Mbps	9 Mbps
QPSK / ½	3 Mbps	6 Mbps	12 Mbps
QPSK / ¾	4.5 Mbps	9 Mbps	18 Mbps
16QAM / ½	6 Mbps	12 Mbps	24 Mbps
16QAM / ¾	9 Mbps	18 Mbps	36 Mbps
64QAM / $^{2}/_{3}$	12 Mbps	24 Mbps	48 Mbps
64QAM / ¾	13.5 Mbps	27 Mbps	

Setting the Clock Configuration

If TDM services are selected then the TDM parameters dialog box appears. (TDM is not relevant in FA4800 ACCESS versions.)

The TDM Parameters dialog box contains five working modes; select the appropriate clock mode according to your application. Choosing one of these modes sets the TDM clock behavior on both sides of the link. The user equipment must be configured as described in the table below.

Table 2-2. TDM Clock Modes

	Unit clock mode		User equipment side	
	Local Unit	**Remote Unit**	**HQ side**	**Branch side**
1	Transparent	Transparent	Internal/Recover	Internal/Recover
2	Loop Time	Recover	Internal	Recover
3	Recover	Loop Time	Recover	Internal
4	Internal	Recover	Recover	Recover
5	Recover	Internal	Recover	Recover

Transparent/Transparent

FA4800 transparently regenerates the clock from line clock side to Tx clock on the opposite side of the link.

Loop time/Recover

The local unit receive clock is the transmit clock on both sides of the link.

Recover/Loop time

The remote unit receive clock is the transmit clock on both sides.

Internal/Recover

The local unit internal oscillator generates the clock while the remote unit recovers this clock.

Recover/Internal

The remote unit internal oscillator generates the clock while the local unit recovers this clock.

Note *The Line code option is used with T1 Systems.*

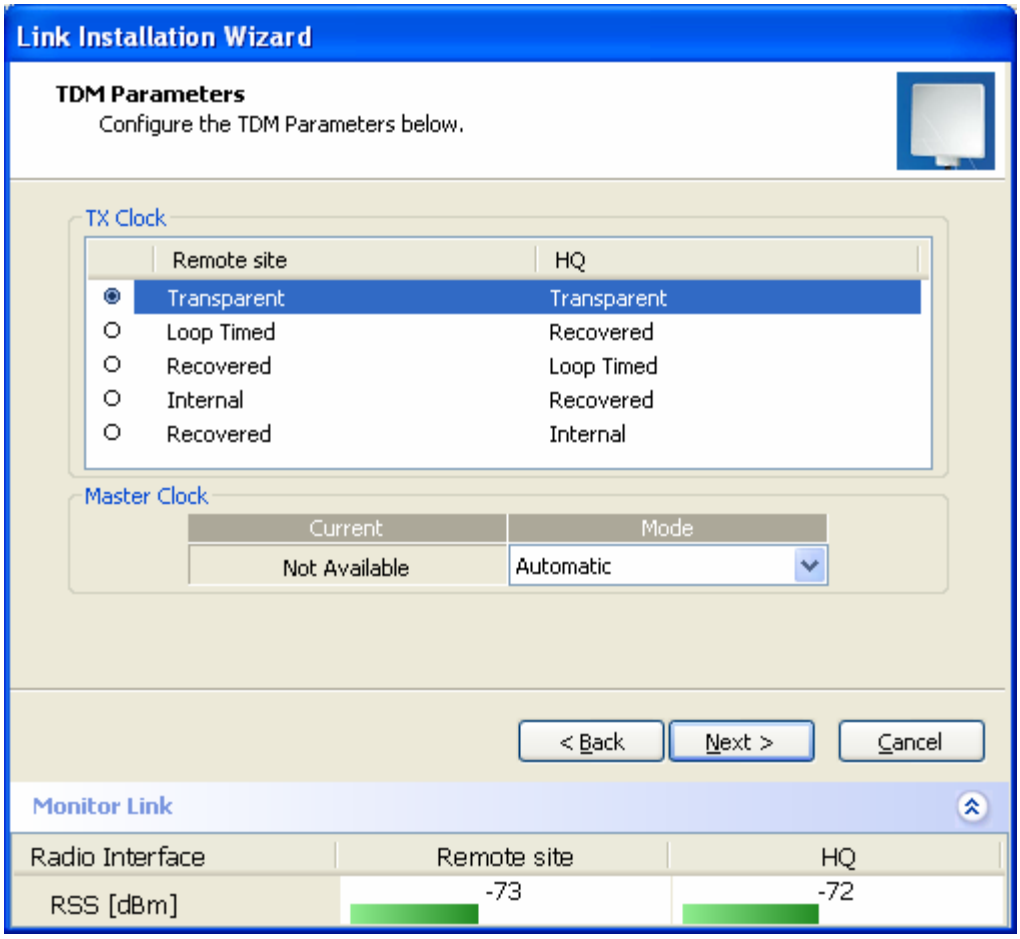


Figure 2-14. TDM Parameters dialog box

Note *This dialog box is available only with IDU-E units, it is activated after TDM service was chosen in the previous Service dialog box. In Ethernet only services, the TDM dialog box does not appear.*

Setting the T1 Line Code

The T1 line code can be set as B8Zs or AMI in the TDM Parameters dialog box.

The default is B8ZS.

➤ **To change the line code**

1. In the TDM Parameters dialog box, set the line code to B8ZS or AMI as required.
2. Click **Next** to show the finish screen.

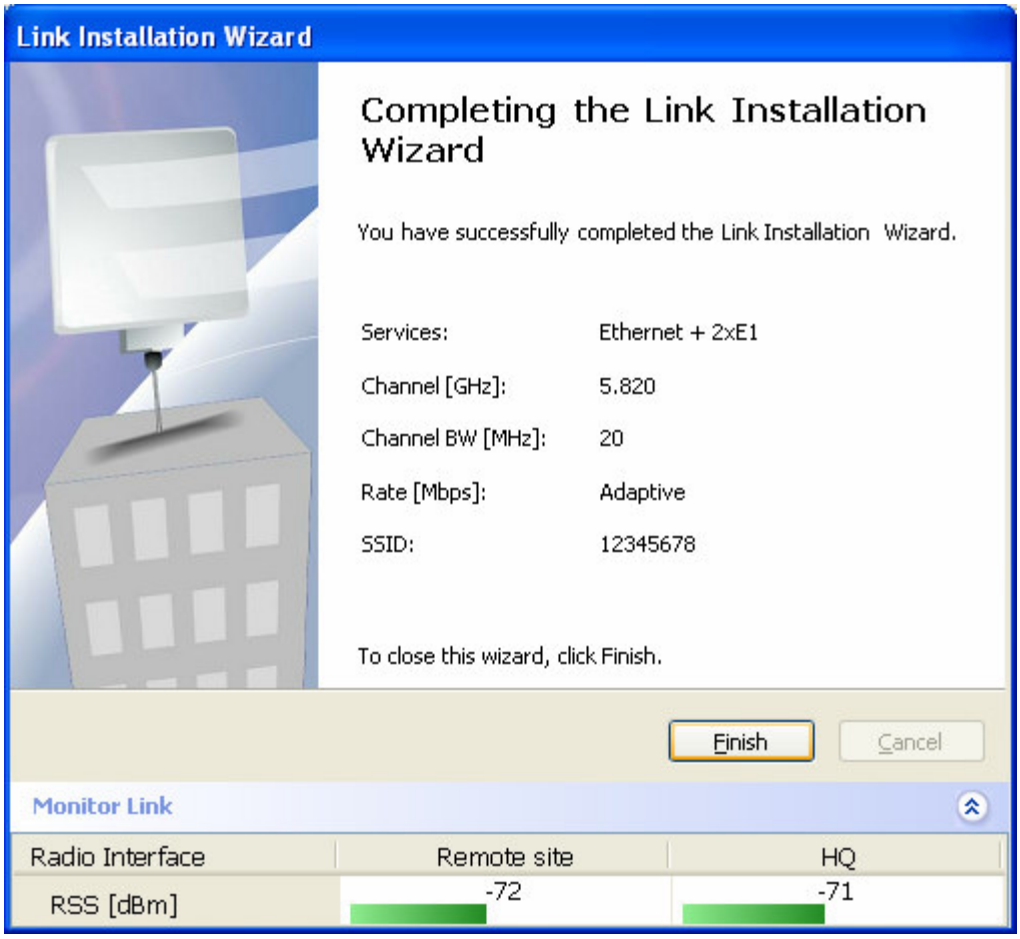


Figure 2-15. Installation Wizard, Finish Screen

5. Click **Finish** to complete the installation wizard.

   When the wireless link is established between the site A and site B units, the Quality bar is within the yellow area for Ethernet only links, or within the green area for Ethernet plus TDM links.

6. Verify that the Radio Signal Strength (RSS) is according to expected results as determined by the Link Budget Calculator.

2.15 Connecting the User Equipment

The IDU is a standalone desktop, wall-mounted or rack-installed unit. *Figure 2-2* illustrates a typical rear panel of the IDU.

➤ **To connect user equipment to the IDU:**

1. Connect user E1/T1 traffic to the IDU panel RJ-45 port designated **TRUNK**. There may be multiple Trunk ports available depending on unit ordered. Refer to *Appendix A* for the connector pinout.
2. Connect user hub/router or any other compatible device to the IDU panel RJ-45 port designated **LAN**. There may be multiple LAN ports available for connecting to different LANs depending on the IDU unit ordered. Refer to *Appendix A* for the connector pinout.

Notes

Use a straight cable for router connection.
Do not connect two LAN ports to the same LAN, or flooding may occur.

Chapter 3

Operation

This section provides the following information for FA4800:

- Operating procedures (turning-on and turning-off)
- IDU indicators
- Normal Indications
- Default settings
- Managing the FA4800

3.1 Turning On FA4800

➤ **To turn on FA4800:**

- Connect the AC/DC converter to the IDU power connector and to the mains. See *Chapter 2* for full instructions on connecting the power.

  The PWR indicator lights up (IDU-E only) and remains lit as long as the IDU is receiving power.

FA4800 requires no operator attention once installed, with the exception of occasional monitoring of front panel indicators and statistics data. Intervention is only required when FA4800 must be configured to its operational requirements, or diagnostic tests are performed.

3.2 Controls and Indicators

IDU Front Panel Indicators

The front panel of the IDU and IDU-E includes a series of LED indicators that show the operating status of the unit. *Figure 3-1* shows the IDU front panel, *Figure 3-2* shows an IDU-E front panel. *Table 3-1, Table 3-2*, and *Table 3-3* describe the indicators.

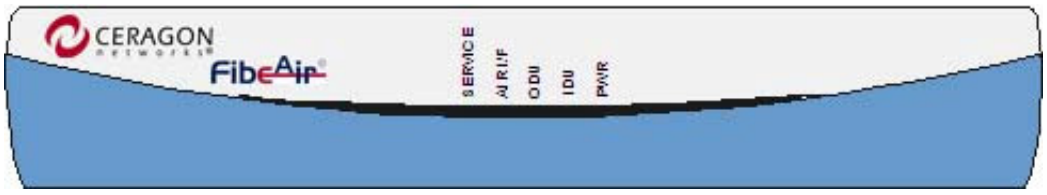


Figure 3-1. IDU-E Front Panel

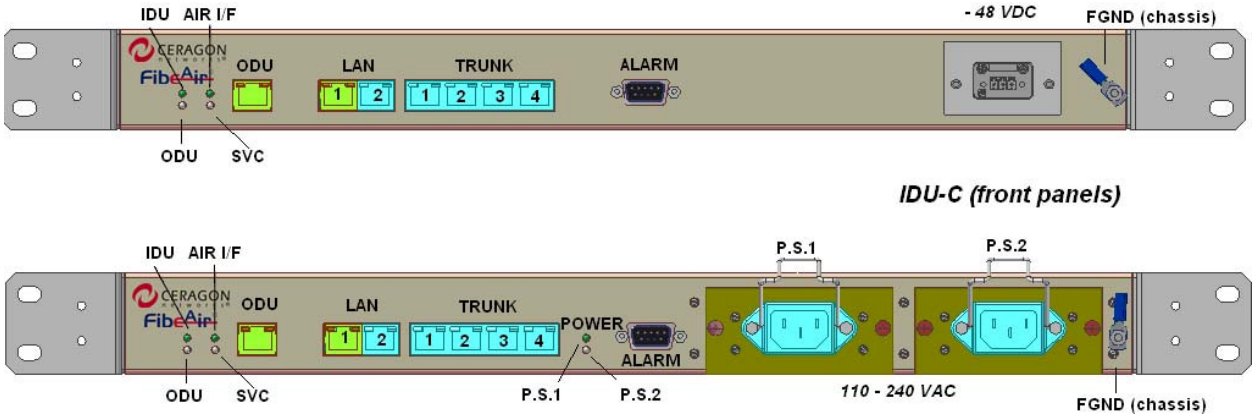


Figure 3-2. Typical IDU-C Front Panels

Table 3-1. Front Panel LEDs

Name	Color	Function
PWR	Green	ON –Power supply is ON (IDU-E only)
IDU	Green	ON – IDU operational
	Orange	ON – During power-up only
	Red	ON – Failure
ODU	Green	ON – ODU-to-IDU communication link is operating
	Red	ON – ODU-to-IDU communication link is disrupted
AIR I/F	Green	ON – Wireless link is synchronized
	Orange	ON – During installation only
	Red	ON – Wireless link lost synchronization
SERVICE	Green	ON – E1 or T1 line is synchronized
	Orange	ON – Alarm detected at the remote interface

		ON – Local or Remote loopback
	Red	ON – Alarm detected at the local interface

WAN/LAN Indicators

The WAN/LAN and TDM connectors (IDU-E rear panel, IDU-C front panel) have LED indicators that show the operating status. *Table 3-2* and *Table 3-3* describe the indicators.

Table 3-2. WAN/LAN LEDs

Name	Color	Function	Location
LINK	Green	On – Good Ethernet link integrity	WAN/LAN connectors
ACT	Yellow	Blinks according to the Ethernet traffic	WAN/LAN connectors

Table 3-3. TDM Traffic Indicators

Function	Green LED	Red LED
OK	On	Off
AIS	Off	On
LOS	Off	On
Loopback	On	Blinking

Normal Indications

Upon turning on FA4800, the PWR LED in the IDU-E front panel lights to indicate that FA4800 is on. *Table 3-4* shows the correct status of the indicators at power-up.

Table 3-4. FA4800 Indicators at Startup

Indicator	Color	Status
PWR	Green	ON (IDU-E only)
IDU	Orange Green	ON for short duration during startup ON during normal operation
ODU	Green	ON shows normal operation
AIR I/F	Orange Green	ON for short duration during startup ON shows normal operation
SERVICE	Green	ON shows normal operation OFF when Service is configured for Ethernet only

If the above LED indications do not appear following initial power turn-on, refer to *Chapter 5* for the diagnostic test instructions.

3.3 Default Settings

Table 3-5 lists the default settings of the FA4800 configuration parameters.

Table 3-5. Default Settings

Parameter	Default Value
ODU IP Address	10.0.0.120
Subnet Mask	255.0.0.0
SSID	–
Frequency	First Frequency in the range
Rate	Adaptive
Services	Ethernet
Ethernet Configuration	Auto Detect
Bridge	Hub Mode. Aging time = 300 sec
Community values	Read-write – netman Local – public-bru1 Remote – public-bru4097

3.4 Managing FA4800

Before starting a management session, make sure that a communication link between local and remote units exists. The Link Status indication bar in the middle of the Main menu must be green and the *Radio Link - Sync* message must appear in the event log (see *Figure 3-3*).

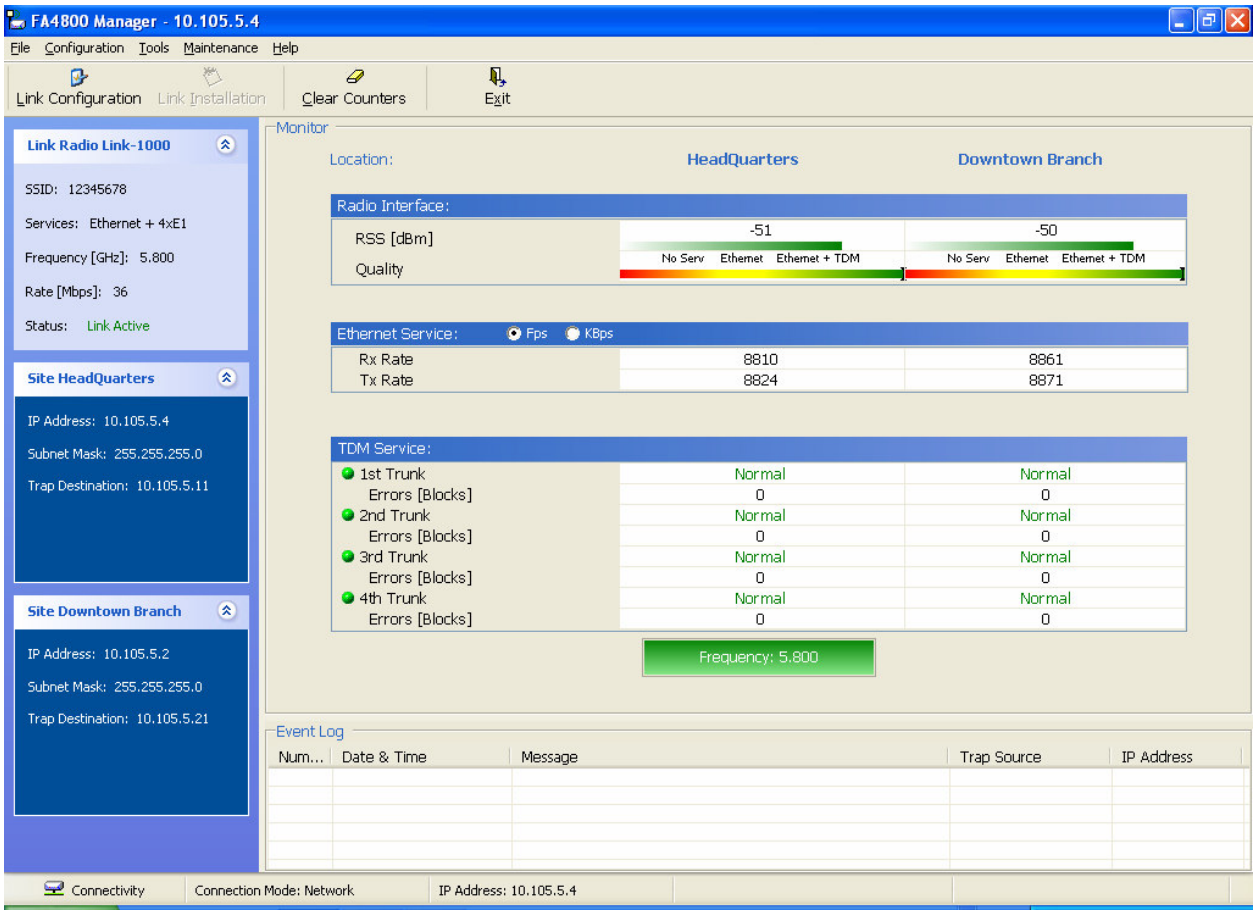


Figure 3-3. Main Screen, Wireless Link is Active

The FibeAir Manager main screen consists of the following elements:

- Toolbar – includes buttons serving for:
  - Changing configuration parameters of operating wireless link; assigning text files for storing alarms, statistics and configuration data (Link Configuration button)
  - Performing preliminary configuration of the system (Link Installation button). This button is disabled once a link is defined.
  - Clearing error counters (Clear Counters button)
  - Logging off FibeAir Manager (Log Off button)
  - Exiting FibeAir Manager (Exit button)

- Menu bar
  - File Menu – Log off, and exit
  - Configuration – use for link configuration, individual site configuration or link installation
  - Tools – set preferences, event log handling, change password
  - Maintenance – Loopbacks, system reset.
- Link details pane – summarizes information on the radio frequency, IP bandwidth, type of TDM service, number of assigned E1 or T1 timeslots, and IP details of the local and remote FA4800 units.
- Monitor pane – displays the link quality between local and remote devices and the following statistics:
  - Radio signal strength (RSS) in dBm
  - Current Ethernet bandwidth in Mbps. This is not the actual traffic rate, but the maximum capacity that can be supported currently, see *Figure 3-4*. The scale on the bar adjusts according the link distance and the link budget.
  - Local/remote receive and transmit traffic rate, in Mbps or Fps (frames per second).
  - TDM status
    The Estimated Time Between Errors bar gives an indication of the TDM quality. The ETBE constantly calculates the expected TDM Error second ratio according to the current air interface conditions.
- Event log – stores alarms generated by local and remote units.
- Status Bar – displays the following ions:
  - Connectivity icon showing how the device is connected to the Ethernet.
    - Network mode to the local unit – using IP of the local unit
    - Over the Air connection - using IP address of the remote for over the air connection
    - Local mode using broadcast - direct connection to IDU LAN port without IP address. This mode is only recommended when the managed PC is connected directly to the IDU (no network involved) the managed PC must have a static IP configured. (No DHCP)
  - Encryption icon showing if the link is encrypted

    encrypted link

    Link Password Validation failed. The link is encrypted with default keys. Service and configuration is unavailable. Need to change the link password in either site

    No Encryption – an older release is used. No encryption is available

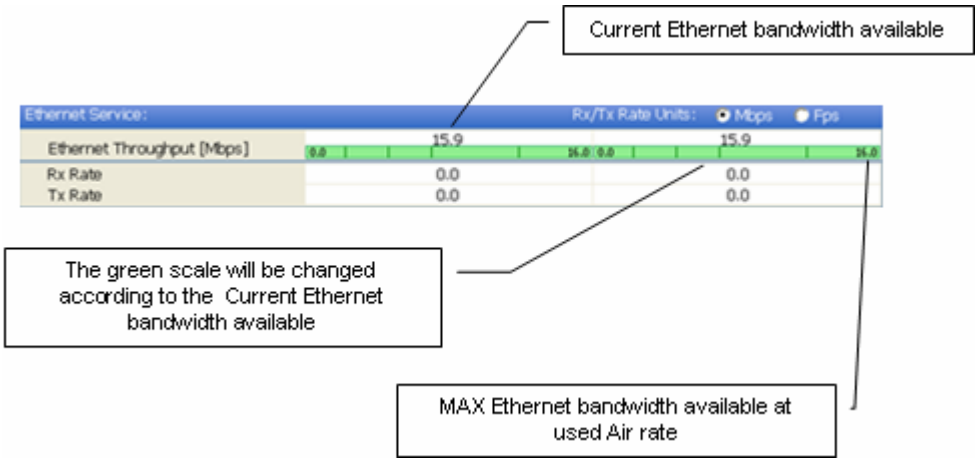


Figure 3-4. Ethernet Bandwidth Indication

➤ **To change link configuration parameters:**

1. In the Main menu, click **Configure Link**.

   The Configure Link wizard appears. See *Chapter 4* for configuration details.

2. Click **Next**.
3. Continue through the configuration wizard and define the Link name and ID, Channel, Rate and Services.
4. Once you finish changing configuration parameters, click **Finish**.

   The system takes a few seconds to activate the link with the new configuration.

3.5 Turning Off FA4800

➤ **To turn off FA4800:**

1. Exit the management application.
2. Remove the AC/DC converter power cord from the mains.

Chapter 4
Configuration

This chapter describes configuration procedures, which are performed after the physical installation of the local and remote FA4800 units and the Installation Link wizard has been performed. A second wizard is used to redefine the configuration parameters if necessary. Both sites in the link are defined simultaneously.

The following parameters are configured via the configuration wizard:

- System parameters
- Frequency channel
- Air interface rate
- Service parameters.

The following parameters are configured via the Configuration dialog box.

- Transmit power
- Management and trap addresses
- Bridge mode
- Ethernet mode
- Community values.

4.1 Configuring the System Parameters

After installing the link, the system configuration can be modified.

Note *All parameter changes are automatically applied to both sides of the link.*

➤ **To change general parameters:**

1. In the Main menu, click the **Link Configuration** button.
2. The Configuration wizard opens (*Figure 4-1*).

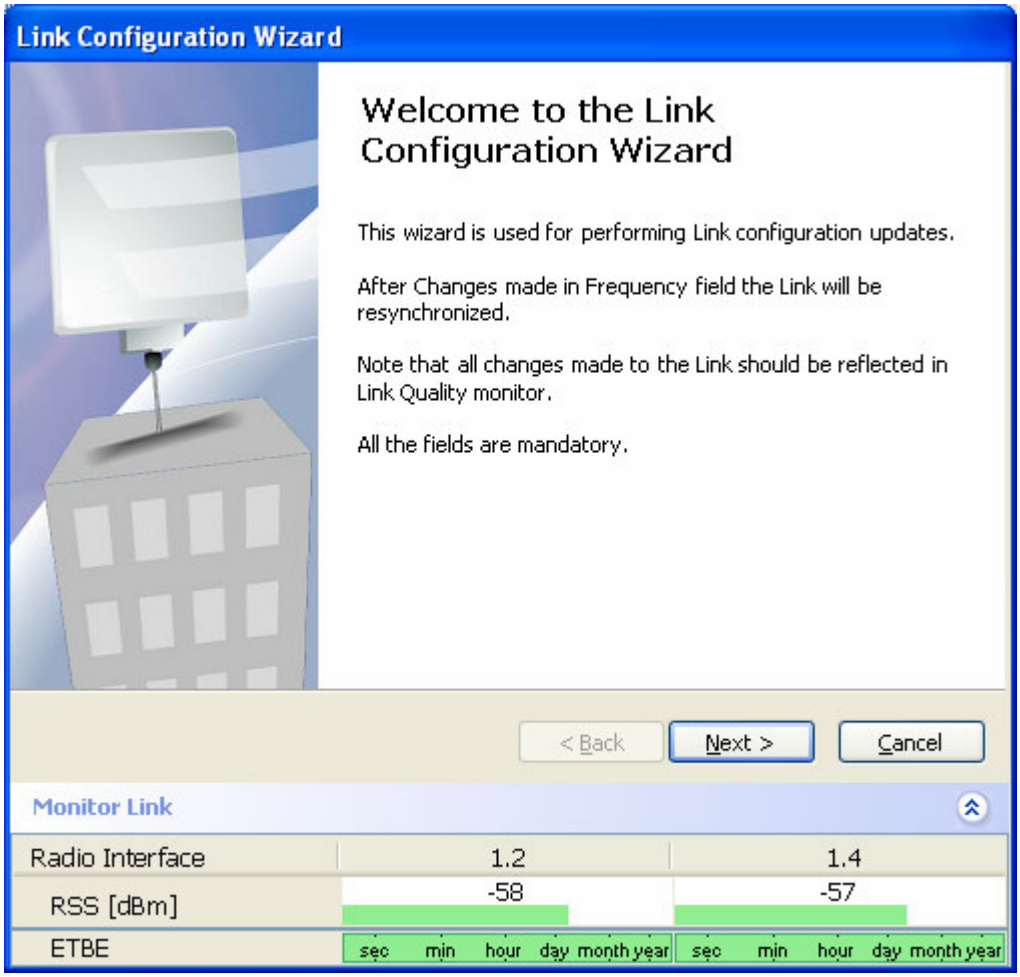

Link Configuration Wizard
Welcome to the Link Configuration Wizard
This wizard is used for performing Link configuration updates.
After Changes made in Frequency field the Link will be resynchronized.
Note that all changes made to the Link should be reflected in Link Quality monitor.
All the fields are mandatory.
< Back
Next >
Cancel
Monitor Link
Radio Interface
1.2
1.4
RSS [dBm]
-58
-57
ETBE
sec min hour day month year
sec min hour day month year

Figure 4-1. Configuration Link Wizard

3. Click **Next**.
4. The Link Configuration dialog box appears (see *Figure 4-2*).

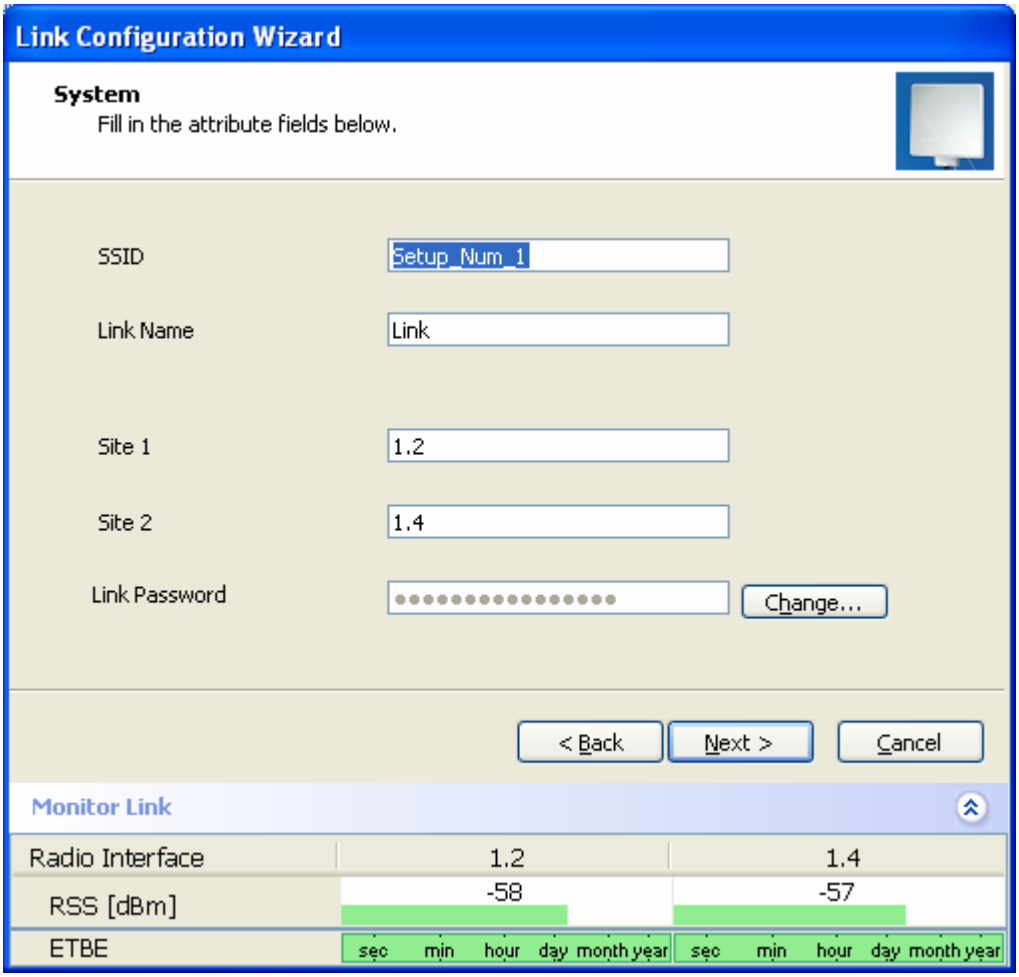


Figure 4-2. Link Configuration, System dialog box

5. In the System dialog box, enter the new data for the link. All fields with a white background can be edited.

6. Click **Next**.

   The Frequency dialog box appears.

4.2 Selecting Channels

The user is required to define the operating frequency channel. Newer versions of FA4800 have a feature called Automatic Channel Select. This allows you to define several allowable frequency channels that FA4800 can change to in event that interference is detected on the channel in use.

- For FA4800 with the Automatic Channel Select feature see *FA4800 with Automatic Channel Select*.
- For FA4800 5.4 GHz ETSI version see *FA4800 5.4 GHz ETSI Version*.

FA4800 with Automatic Channel Select

Automatic Channel Select enables FA4800 to change frequency channels automatically if interference is detected on the current operating channel.

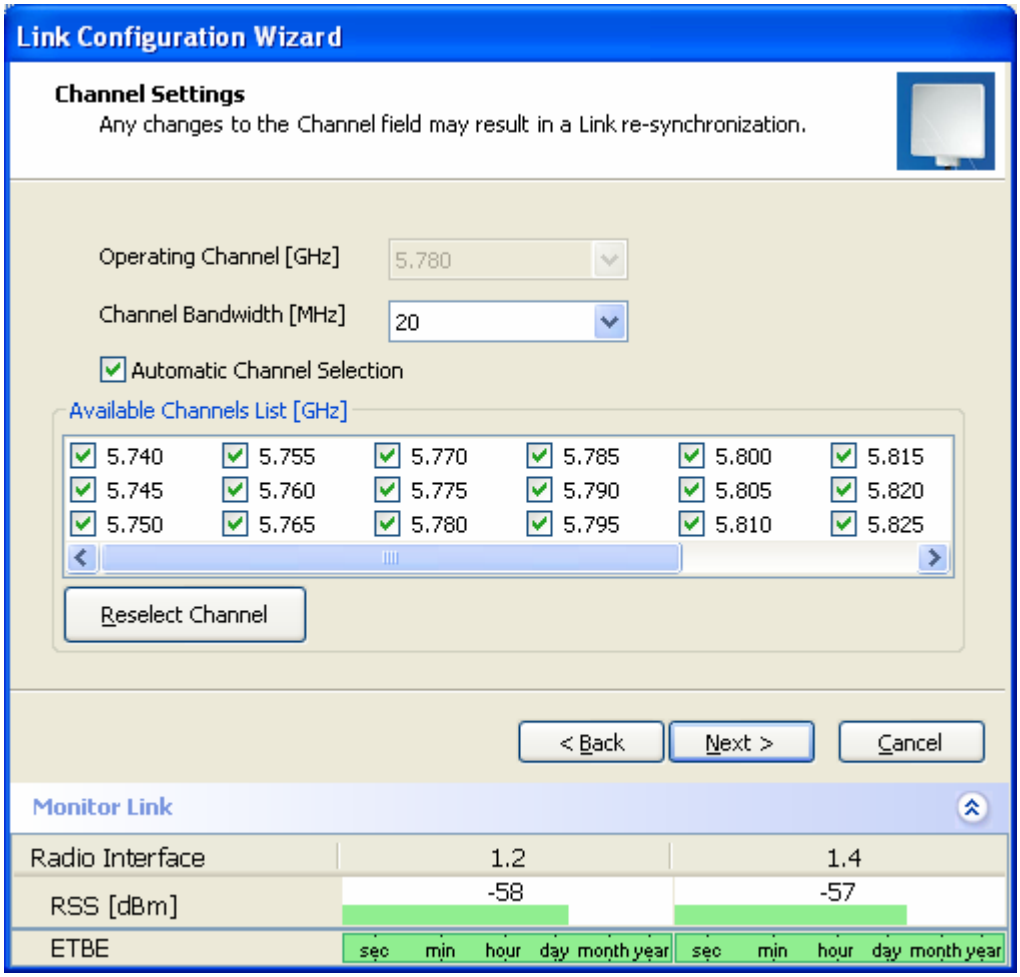


Figure 4-3. Channel Select dialog box - Automatic Channel Select

➤ **To define automatic channel selection:**

1. Select the main frequency from the Operating Channel menu.
2. Select the required Bandwidth 5, 10, or 20 MHz.

Note *F2.x GHz versions operate at 10 or 20 MHz steps only.*

3. Click the check box if Automatic Channel Selection is required.
4. Click the check boxes in the Available Channels List of all the allowable channels that can be automatically selected.
5. If you are not satisfied with the channel that is selected automatically, click **Reselect Channel**.

   A new channel will be selected from one of the Available Channels that have been defined.

Note *By clicking Reselect Channel, the ODU starts scanning all the channels from the available channels list and looks for radio frequency activity in each of the channels.*

It tries to select the optimal pure channel. If another channel is required, the operating channel that the ODU finds most pure must be removed from the available channel list.

1. Click **Next**.

   The Rate Select box appears.

FA4800 5.4 GHz ETSI Version

In accordance with ETSI, unlicensed wireless data equipment is not allowed to interrupt radar services. Therefore, if FA4800 detects Radar interference it automatically changes the frequency channel. This feature is termed Dynamic Frequency Selection (DFS). According to the standard, a channel with active Radar is prohibited from use for 30 minutes. Before any transmission, FA4800 probes a channel for Radar signals for a period of 60 seconds.

In the 5.4 GHz ETSI version, the Automatic Channel Selection is selected by default and a minimum of two channels must be defined as available.

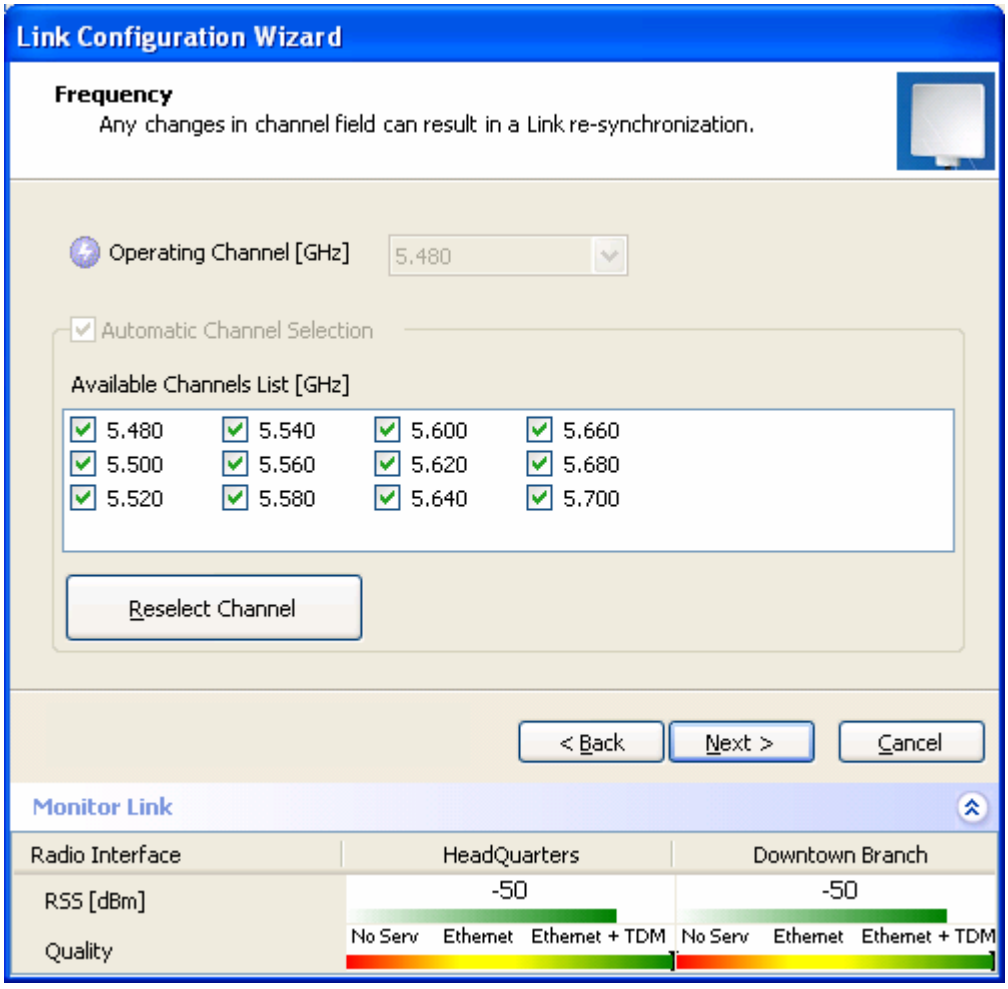


Figure 4-4. Channel Select dialog box (DFS, ETSI requirement)

The sign on the configuration Wizard and Status bar indicates that the radar detection is on.

➤ **To define automatic channel selection in the 5.4 ETSI version**

1. Select the main frequency from the Operating Channel menu.

Note *Automatic Channel Selection is selected by default.*

2. Click at least two check boxes in the Available Channels List of all the allowable channels that can be automatically selected.

Note *Installation will not continue until at least two channels are defined.*

Selecting a new channel causes the system quality to change. The quality bar shows the adjustment until the system finds the best quality link.

Any channel selected is evaluated for 60 seconds; therefore this selection process may take a few minutes.

3. If you are not satisfied with the channel that is selected automatically, click **Reselect Channel**.

   A new channel will be selected from one of the Available Channels that have been defined.

Note *The reselection process may take a few minutes.*

4. Click **Next.**

   The maximum rate is selected according to the link conditions

   The quality bar shows the adjustment until the system finds the best quality link.

6. Click **Next**.

   The Service Parameters dialog box appears.

4.3 Configuring Service Parameters

The user defines the type of service required, Ethernet Only or Ethernet with TDM. The bandwidth remaining available for Ethernet if TDM services are required is shown in the dialog box.

Note *FA4800 ACCESS versions are Ethernet Only.*

In the Service Parameters dialog box select if FA4800 is to provide E1/T1, (x1 or x2 for IDU-E, or x4 for IDU-C). Define the required transmission rate, and the distance between the sites.

➤ **To configure E1/T1 and Ethernet services:**

1. In the Service dialog box, select one of the following:
   - Ethernet plus a number of E1/T1 channels (see *Figure 4-5*).
   - Ethernet data only (see *Figure 4-6*).
2. Select the transmission rate required.

   The default rate is Adaptive. ACCESS versions only operate in Adaptive mode. Adaptive Modulation - The system changes modulation automatically depending on channel characteristics in order to guarantee continuation of

service. The adaptive modulation enables the user to maximize Ethernet throughput without degradation of the TDM service quality.

When Ethernet only service is used, the adaptive modulation enables improving the Ethernet performance in case of air performance degradation (periodical interference or RSS changes).

Note that in case of interference at one site, there is no need to use a lower modulation at the other site (as in previous versions). In such a case the actual rate changes automatically only at the problematic site, while the second side of the link maintains the highest rate possible (Asymmetric).

Adaptive modulation can be changed in both Installation and Configuration wizards.

3. Type in the distance between the sites.

   If TDM services are selected, then the Evaluate icon shows on the screen whilst the maximum rate is evaluated.
   When evaluation is complete the icon changes and the following message is shown:

   Service has been evaluated, click **Next** to continue.

4. Click **Next**.

   The TDM Parameters dialog box or the Finish screen appears depending on which services were selected.

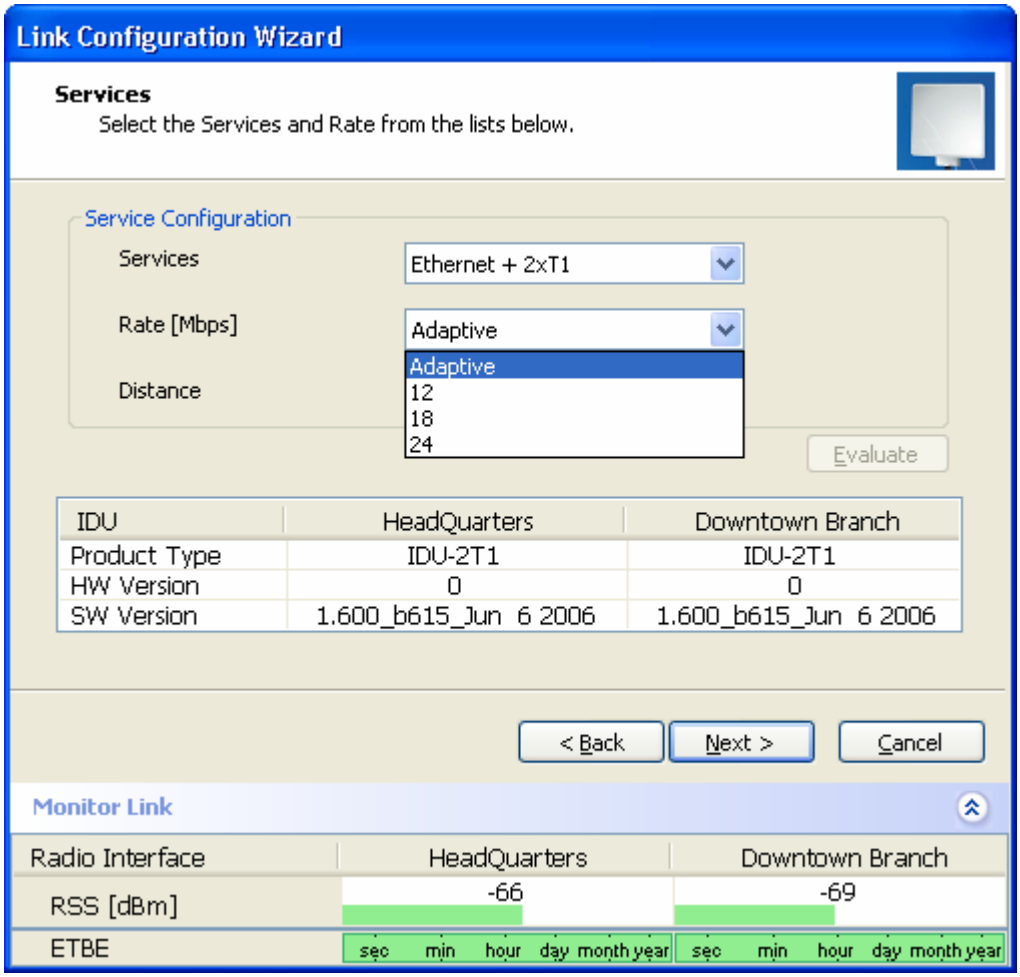


Figure 4-5. Service Parameters Dialog Box, E1/T1 Interface

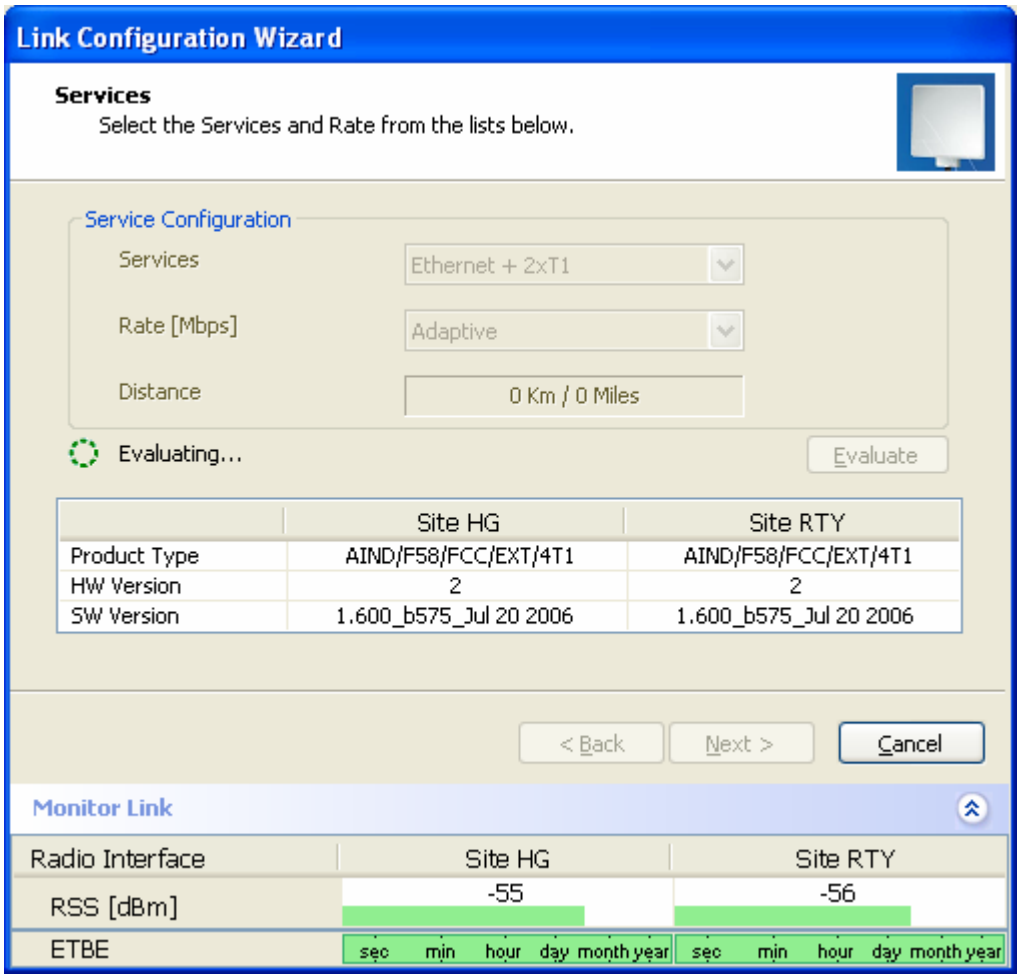


Figure 4-6. Service Parameters Dialog Box, Evaluation Icon

4.4 Setting the Clock Configuration

The TDM clock feature is enabled in all carrier class IDU's in addition to new hardware IDU's. A TDM dialog box will appear where IDU supports the clocking configuration feature (see *Figure 4-7* and *Figure 4-8*).

A new master clock configuration option is available in the Link Configuration Wizard. The automatic mode selects the clock from the first trunk that is working in normal mode (or is configured to loop-back maintenance). If a specific trunk is selected, this trunk shall be used as the system master regardless of the trunks state. The current master clock trunk is also displayed.

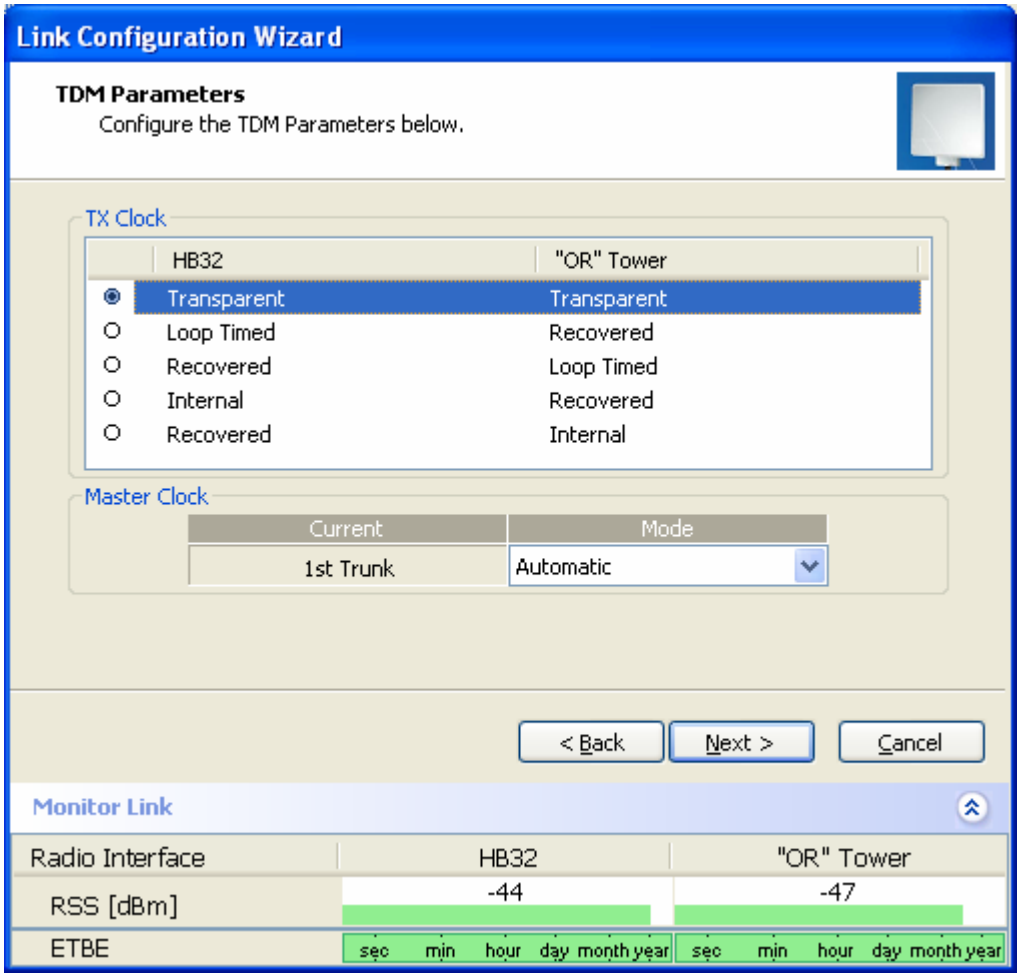


Figure 4-7. TDM clock dialog box for T1 IDU

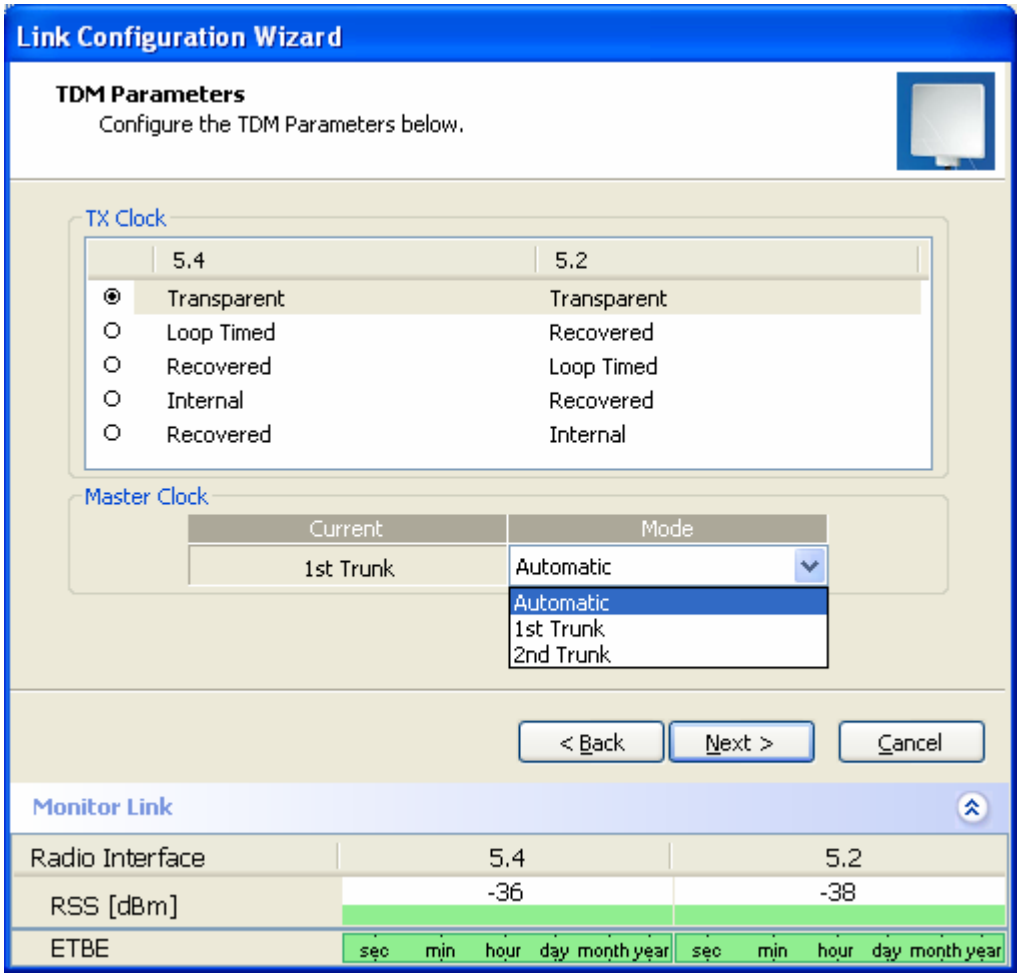


Figure 4-8. TDM clock dialog box for E1 IDU

If TDM services are selected then the TDM parameters dialog box appears.

The TDM Parameters dialog box contains five working modes; select the appropriate clock mode according to your application. Choosing one of these modes sets the TDM clock behavior on both sides of the link. The user equipment must be configured as described in the following table.

Table 4-1. TDM Clock Modes

	Unit clock mode		User equipment side	
	Local Unit	**Remote Unit**	**HQ side**	**Branch side**
1	Transparent	Transparent	Internal/Recover	Internal/Recover
2	Loop Time	Recover	Internal	Recover
3	Recover	Loop Time	Recover	Internal
4	Internal	Recover	Recover	Recover
5	Recover	Internal	Recover	Recover

Transparent/Transparent

FA4800 transparently regenerates the clock from line clock side to Tx clock on the opposite side of the link.

Loop time/Recover

The local unit receive clock is the transmit clock on both sides of the link.

Recover/Loop time

The remote unit receive clock is the transmit clock on both sides.

Internal/Recover

The local unit internal oscillator generates the clock while the remote unit recovers this clock.

Recover/Internal

The remote unit internal oscillator generates the clock while the local unit recovers this clock.

Note

The Line code option is used with T1 Systems.

4.5 Setting the T1 Line Code

The T1 line code can be set as B8Zs or AMI in the TDM Parameters dialog box.

The default is B8ZS.

➤ **To change the line code**

1. Run the Configuration wizard until you reach the Services dialog box.
2. Verify that T1 services have been selected.
3. Click **Next** to open the TDM Parameters dialog box.
4. Set the line code to B8ZS or AMI as required.
5. Click **Next** to finish the wizard.

Note

This dialog box is available only when TDM service was selected in the previous Services dialog box.

1. Click **Next**.

   The Finish screen appears, showing a summary of the link configuration (see *Figure 4-9*).

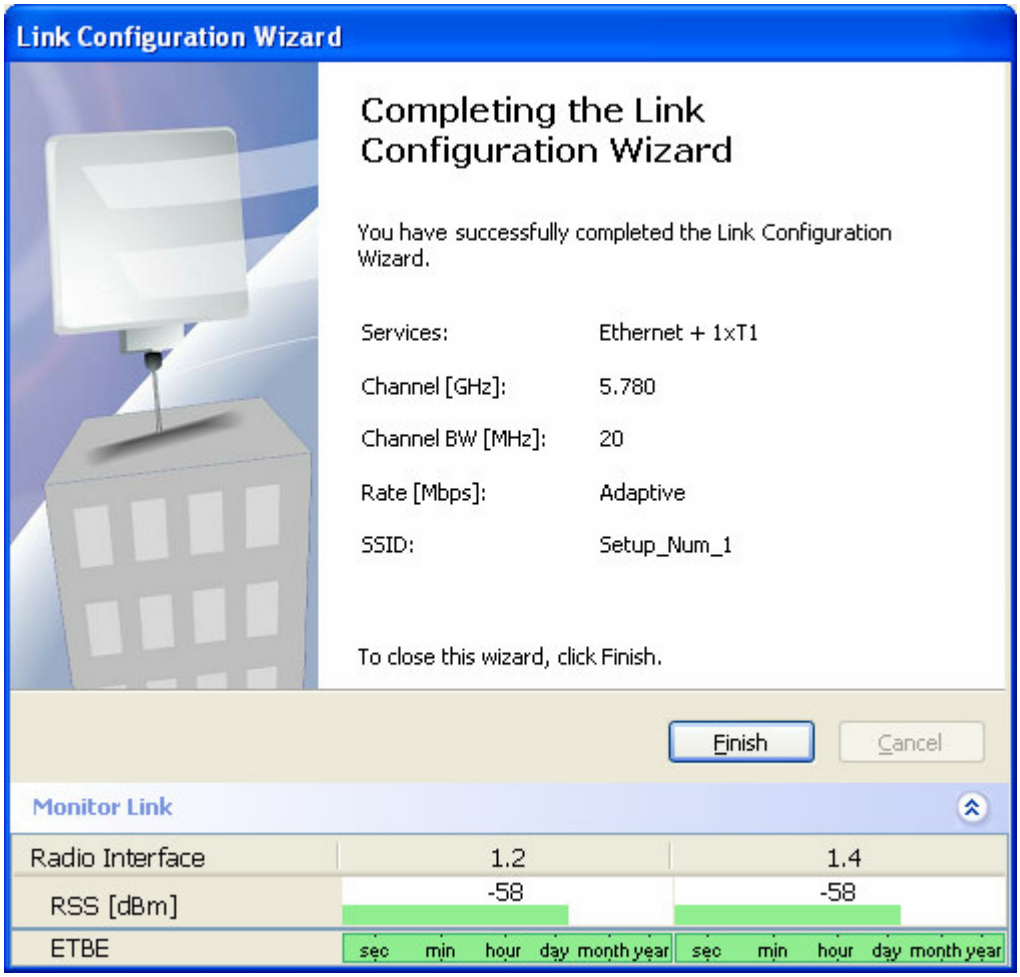

Link Configuration Wizard
Completing the Link Configuration Wizard
You have successfully completed the Link Configuration Wizard.
Services: Ethernet + 1xT1
Channel [GHz]: 5.780
Channel BW [MHz]: 20
Rate [Mbps]: Adaptive
SSID: Setup_Num_1
To close this wizard, click Finish.
Finish
Cancel
Monitor Link
Radio Interface 1.2 1.4
RSS [dBm] -58 -58
ETBE sec min hour day month year sec min hour day month year

Figure 4-9. Configuration Link, Finish screen

7. Click **Finish** to complete the configuration wizard.
   The Main screen is displayed.

4.6 Editing the Configuration Parameters

You can edit the configuration parameters for each site individually without running a wizard.

From the Configuration dialog box, (see *Figure 4-10*) the following functions are available by selecting the items on the left of the dialog box:

System Edit the contact person and location details. View the system details

Air Interface Change the transmit power

Inventory View the hardware and software inventory.

Management Configure the IP address, Subnet Mask, Default Gateway, and the Trap Destination.

Security Change the Community Values and the Link Password

Date and Time Set the date and time of the server and of the system.

Advanced Configure the Bridge, define the LAN connection and set the external alarm inputs.

From the Configuration dialog box, the following functions are available by clicking the buttons at the top of the dialog box:

Backup Save a backup.ini file with the current configuration.

Restore Load the backup.ini file created by the backup.

Installation Mode Return to Installation Mode for the entire link. Selecting the Mute check box before clicking the Install Mode button mutes the Beeper.

Mute Mutes the Beeper at startup. Reactivate the beeper during alignment.

➤ **To edit the Configuration Parameters:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.

   The Configuration dialog box opens. (See *Figure 4-10*)

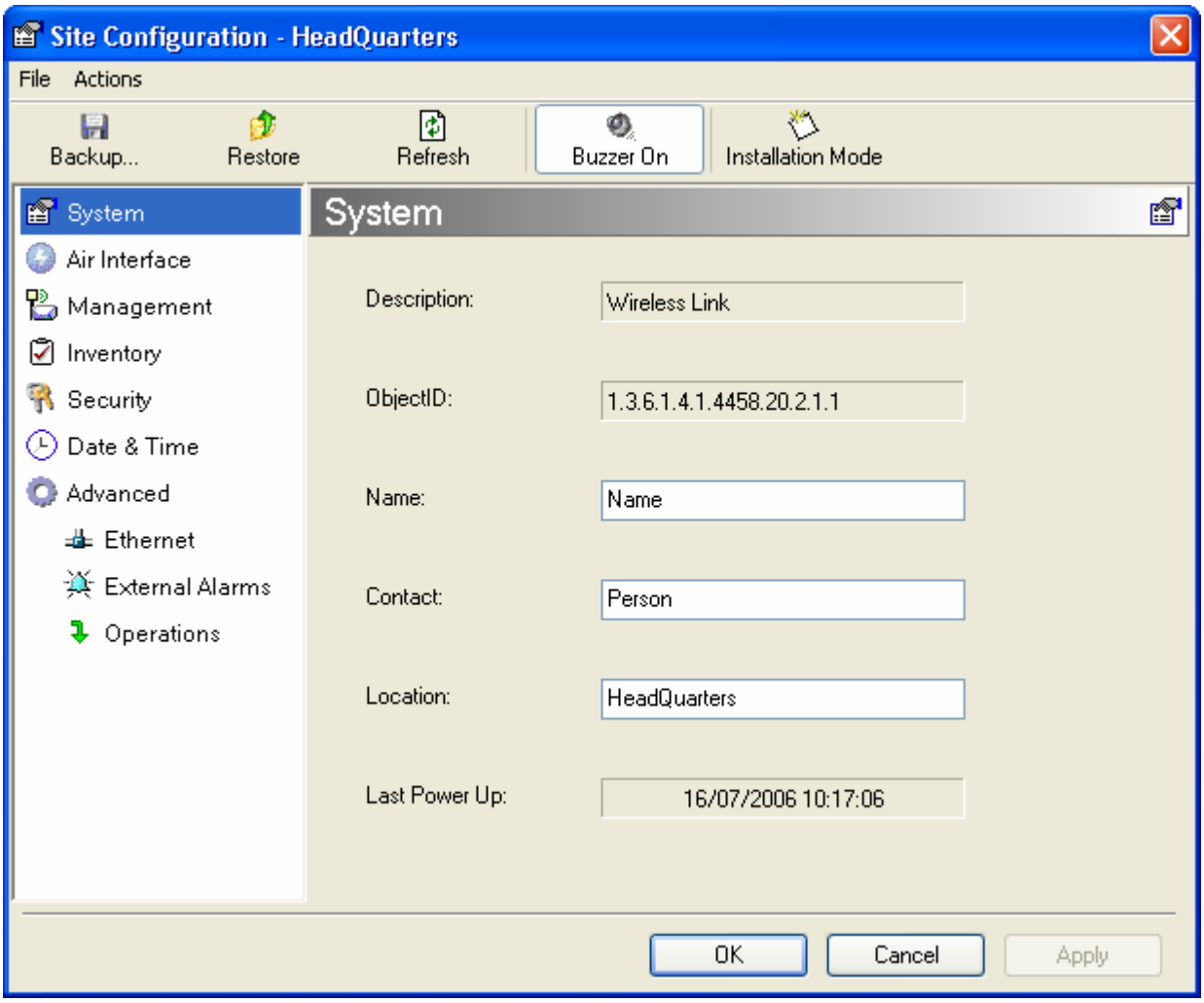


Figure 4-10. Configuration Dialog Box

3. Select the appropriate item in the left hand list to open a dialog box.
4. Click **Apply** to save the changes.

4.7 Changing the Transmit Power

Each site can have a different transmit power level.

➤ **To change the Transmit Power:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.
   The Configuration dialog box opens.
3. Select Air Interface.
4. Select the required Transmit Power Level. Table 4-2 shows the available power limits for each FA4800 system.
5. Click Apply to save the changes.

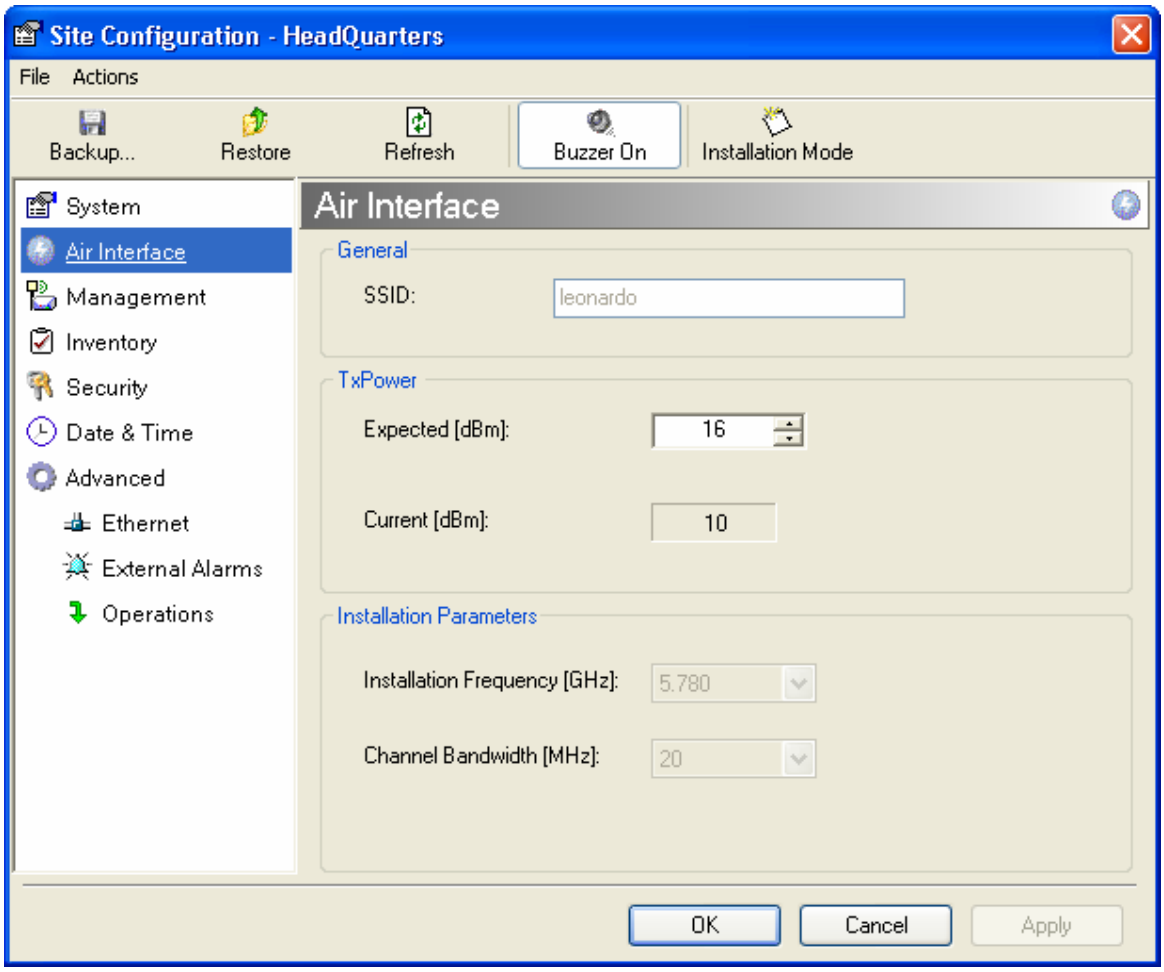


Figure 4-11. Changing the Transmit Power

Table 4-2. Typical Transmit Power Limits

Regulation	Version	Min Tx [dB]	Max Tx [dB]	MaxTx at 36 Mbps [dB]	MaxTx at 48 Mbps [dB]	Power Control
FCC	F58	4	16	14	10	Yes
	F58/EXT	4	16	14	10	Yes
	F49	14	15	15	14	No
	F53	-3	8	8	8	Yes
	F53/EXT	3	3	3	3	No
	F24	18	18	18	18	No
	F53HP	10	16	14	10	Yes
India	F58CN	-1	10	10	10	Yes
China	F24/EXT/ETSI	-4	-4	-4	-4	No
ETSI	F54	2	8	8	8	Yes
	F54/ETSI	2	8	8	8	Yes
	F54-HG/EXT	-3	3	3	3	Yes

4.8 Defining the Management Addresses

Each site must be configured separately, first site A then site B.

➤ **To define the Management Addresses:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.
   The Configuration dialog box opens.
3. Select Management (see *Figure 4-12*).
4. Enter the IP address of the ODU in the IP address field.

Note *If performing configuration from the FibeAir manager, the IP address is entered in the login screen (Figure 2-4)*

5. Enter the Subnet Mask.
6. Enter the Default Gateway.
7. Enter the Trap Destination. This is the IP address of the PC running the management application. The event log will be stored at this address.
8. Click **Apply** to save the changes.

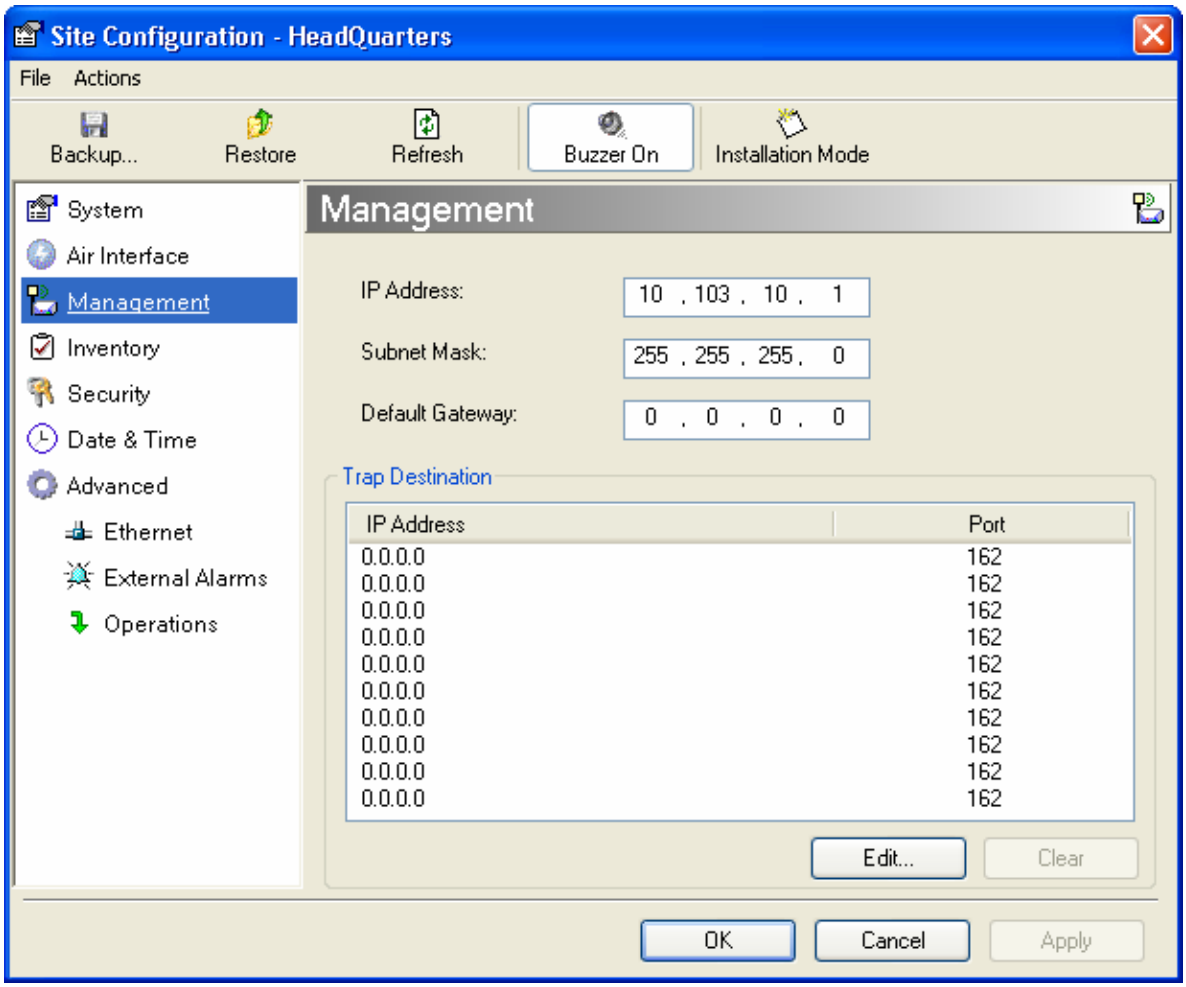


Figure 4-12. Configuration, Management

Notes *The Installation mode button opens the Link Installation wizard to reinstall the link. The Backup and Restore buttons are for saving and restoring the configuration files.*

4.9 Setting the Date and Time

➤ **To set Date and time**

The ODU maintains a date and time value. The date and time value should be synchronized with any Network Time Protocol (NTP) version 3 compatible server[1]. On power-up the ODU configures the initial date and time using an NTP server. If the server IP is not configured or is not reachable, a default time is set. When configuring the NTP server IP, you should also configure the offset from the Universal Coordinated Time (UTC). If there is no server available, you can either set the date and time, or you can set the manager workstation time. Note that manual setting is not recommended since reset, power up, or synchronization with an NTP server will override the setting.

[1] Windows XP is configured by default as a server.

Note

- *The NTP uses UDP port 123. If a firewall is configured between the ODU and the NTP server this port must be opened*[2].
- *It can take up to 8 minutes for the NTP to synchronize the ODU date and time.*

1. Click **Configuration** from the main menu.
2. Select which site to configure.

   The Configuration dialog box opens.
3. Select Date & Time (see Figure 4-13).

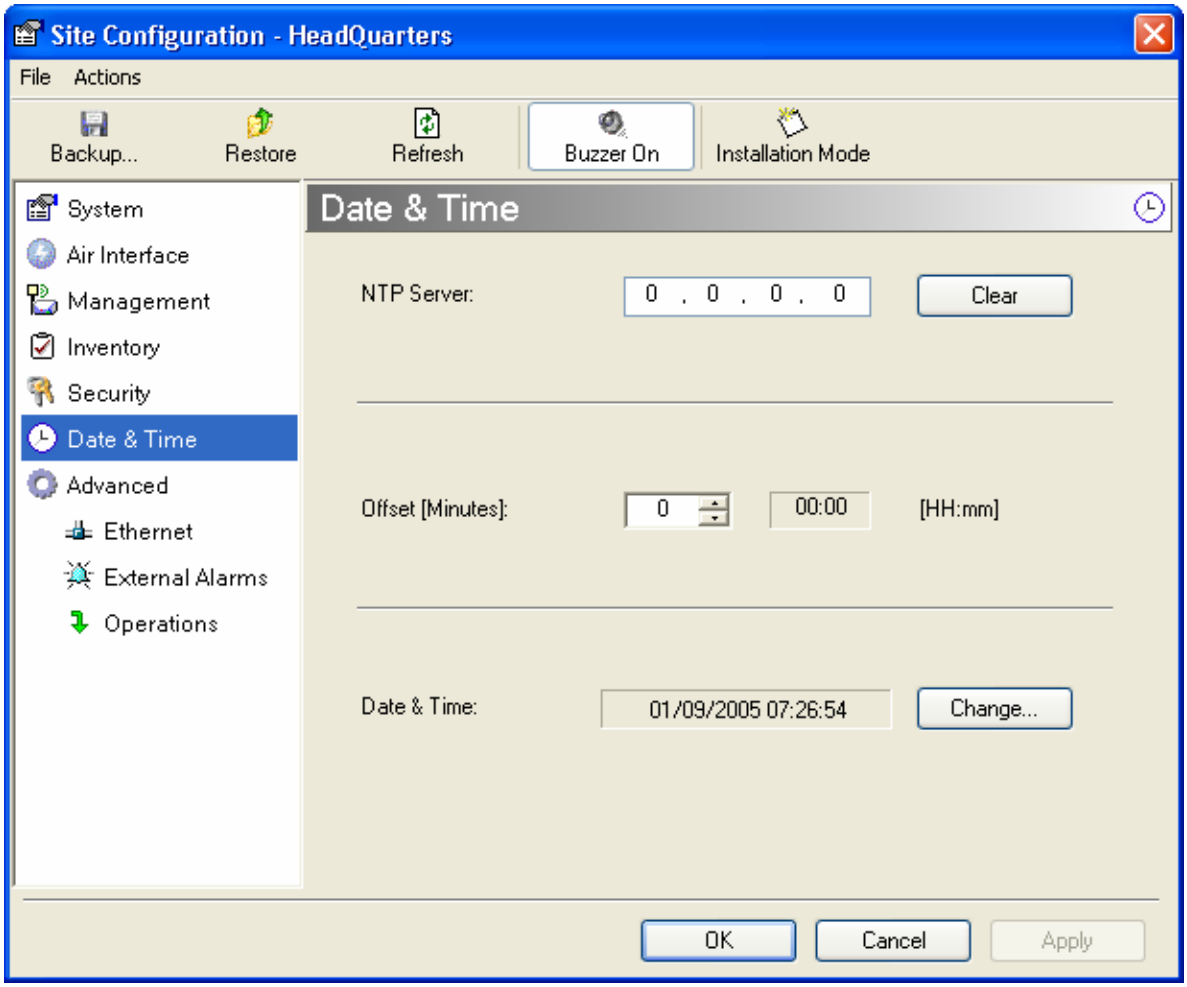


Figure 4-13. Date & Time configuration

4. If entering an address for the NTP Server, click **Clear**, and then enter the new address.
5. Set the Offset value.
6. To manually set the date and time, click **Change** (*Figure 4-14*) and edit the new values.

[2] Windows XP command w32tm /stripchart /computer:<server IP> can be use to check the NTP server connectivity

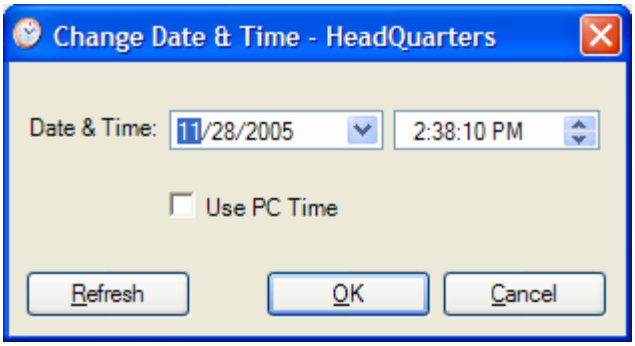


Figure 4-14. Manually changing date and time

4.10 Configuring the Bridge

Bridge configuration is required in various network topologies, such as protection (1+1) and ring application. The bridge configuration parameters are located under the Advanced tab of the Configuration dialog box (*Figure 4-15*). There are three parameters to configure:

- ODU bridge mode
- IDU Aging time
- Ethernet mode

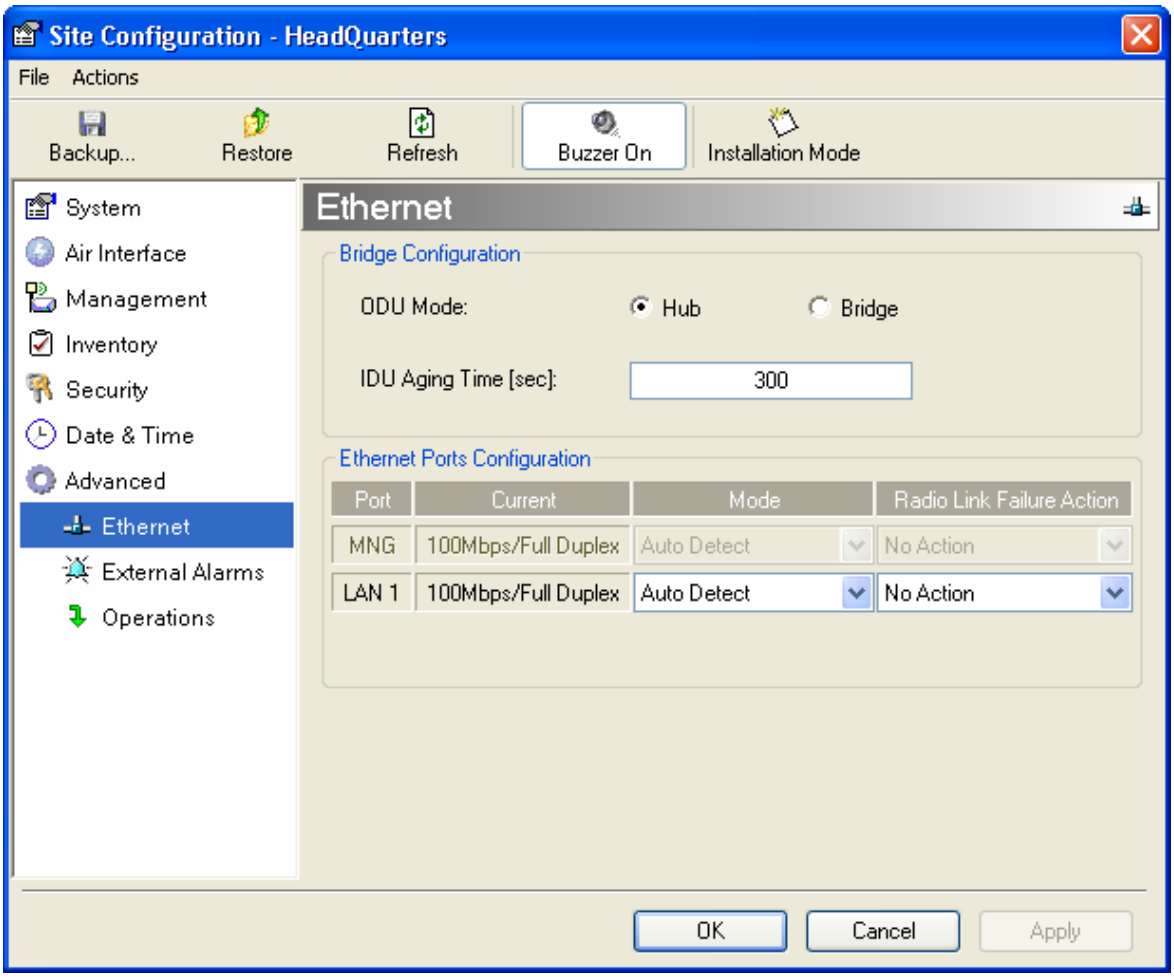


Figure 4-15. Advanced Configuration-Ethernet

ODU Bridge Mode

This parameter controls the ODU mode with two optional values,

- Hub Mode – in Hub mode the ODU transparently forwards the all the packets over the wireless link.
- Bridge Mode – In Bridge mode the ODU performs both learning and aging, the aging time of the ODU is fixed at 300 seconds.

Note *Changing these modes requires system reset.*

IDU Aging time

This parameter controls the IDU aging time.

The IDU has a 2047 MAC address-learning table. The aging time parameter controls the time each MAC address is dropped from the table.
Default value is 300 seconds.

Notes *Any change to these parameters is effective immediately.*
Each side of the link can be configured separately.

The following list details common configurations; both sides are must be configured with the same parameter.

- Standard (Default) Configuration for Ethernet Applications

  Set IDU aging to 300 seconds, ODU set to Bridge mode, *Figure 4-15*.
- Fast aging mode – for rapid network topology changes

  Set IDU aging to one second, ODU set to Hub mode.
- Hub Mode

  The ODU is set to HUB mode. IDU aging is not applicable.
- Ethernet Bridge

  The ODU is set to Bridge mode. The IDU aging is not applicable.

4.11 Configuring Ethernet Mode

The Ethernet mode is configurable for line speed (10/100BaseT) and duplex mode (half or full duplex). FA4800 provides an Auto detect feature where the line speed and duplex mode are detected automatically using autonegotiation. Use the manual configuration when external equipment does not support autonegotiation. The default setting is Auto Detect. (See *Figure 4-15*)

Note *It is not recommended to configure the port that is used for the management connection, since a wrong configuration can cause management disconnection or Ethernet services interruption.*

➤ **To configure the Ethernet Mode:**

1. From the **Configuration** menu, select the site to reconfigure.
   The Configuration dialog box opens.
2. In the Ethernet Ports Configuration pane, use the drop-down menu to select the LAN configuration.
3. Click **Apply** to save the changes.

Note *It is possible to close the Ethernet service by disconnecting the Ethernet port. The user should be aware that it is possible to close the port and not have any access to the device. If this should occur the workaround is as follows:*

- *Connect the system from the remote site*
- *Connect via other Ethernet port (IDU-C)*
- *Power down the equipment and connect immediately after the power up (the fastest way is to enter install mode).*

4.12 Changing Community Values

The ODU communicates with the management application using SNMPv1 protocol. The protocol defines three types of communities:

- Read-Only for retrieving information from the ODU
- Read-Write to configure and control the ODU
- Trap used by the ODU to issue traps.

The community string must be entered at login. The user must know the password and the correct community string in order to gain access to the system. A user may have read-only privileges.

It is not possible to manage the ODU if the read-write or the read community values are forgotten. A new community value may be obtained from technical support for the purpose of setting new community; the serial number or the MAC address of the ODU must be supplied.

Note *The manager application and the ODU use the community strings **public-bru1** for the local unit and **public-bru4097** for the remote unit. These are the factory defaults, but can only be used one time on the first installation.*

A new community string must be set when entering the system for the first time. The read-write community and read-only community have a minimum of five alphanumeric characters. (Bru1 and bru4097 are not permitted). Changing the trap community is optional by clicking the check box.

Editing Community Strings

The community change dialog box is available from the **Configuration > Security** tab. Both read-write and read-only communities must be defined.

On entering for the first time, use **netman** as the current community. The community string must be changed when entering the system for the first time, and the community string **netman** cannot be used again.

➤ **To change a community:**

1. From the Configuration dialog box, select the **Security** tab
2. Type the current read-write community (default is **netman**).
3. Select the communities to be changed by clicking the check box.
4. Type the new community and re-type to confirm.
5. Click **OK** to save.

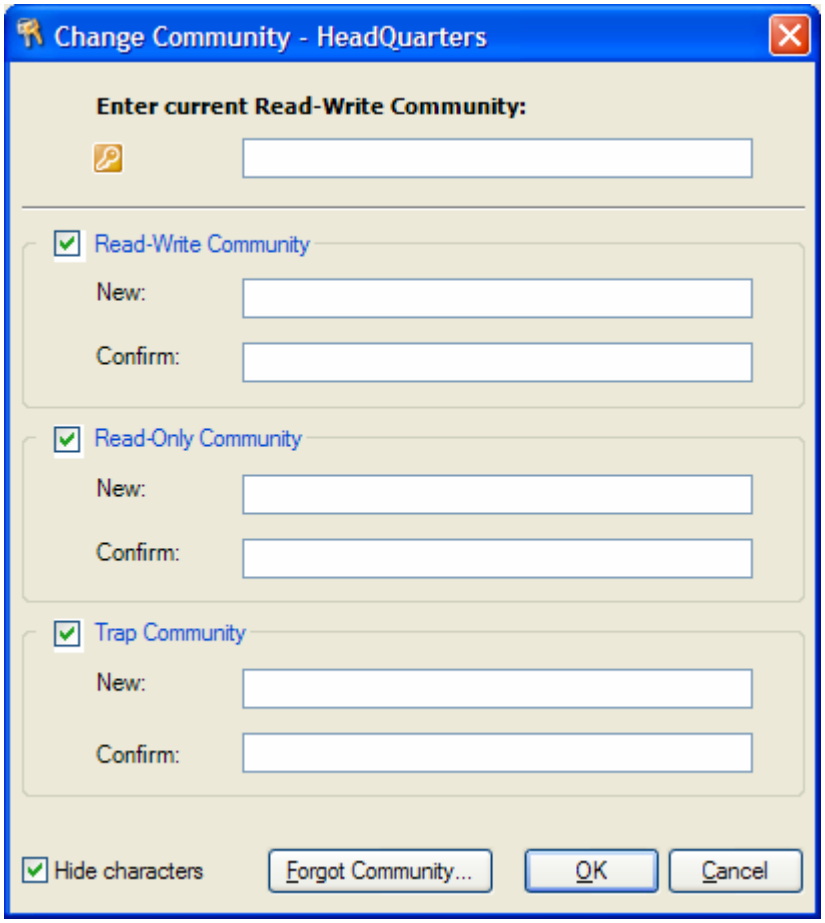


Figure 4-16. Changing the Community String

Forgotten Community string

If the read-write community string is unknown, an alternative community key can be used. The alternative community key is unique per ODU and can be used only in order to change the community strings. The alternative community key is supplied with the product, and it is recommended to keep it safe.

If both the read-write community and the alternative community key are unavailable, then an alternative community key can be obtained from customer support using the ODU serial number or MAC address. The serial number is located on the product, and the MAC address is displayed in the manager inventory tab.

When you have the alternative community key, click the **Forgot Community** button and enter the Alternative Community (*Figure 4-17*). Then reconfigure the read-write community string.

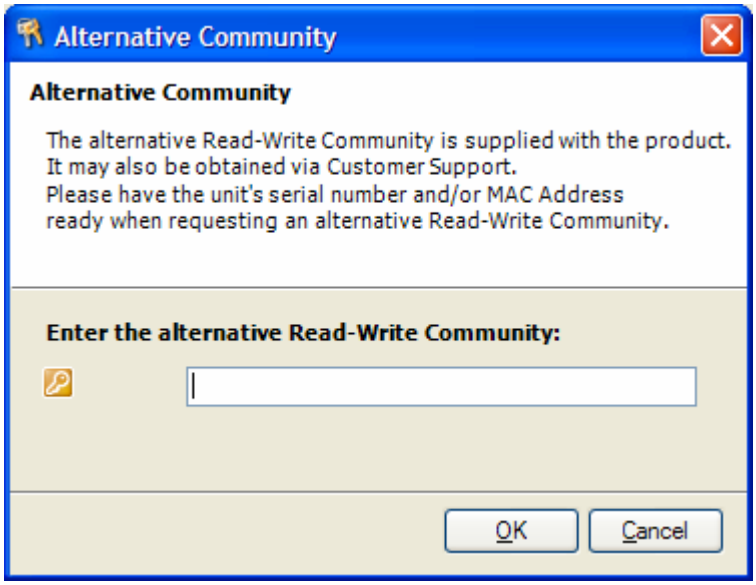

Alternative Community
Alternative Community
The alternative Read-Write Community is supplied with the product.
It may also be obtained via Customer Support.
Please have the unit's serial number and/or MAC Address
ready when requesting an alternative Read-Write Community.
Enter the alternative Read-Write Community:
OK
Cancel

Figure 4-17. Alternative Community Dialog box

4.13 Changing Passwords

There are two passwords necessary to use the FA4800 system. The first is encountered when running the management software, the second, the link Password is used for encryption purposes and is found when installing or configuring the link.

Changing the Management Password

➤ **To change the management password**

1. From the Tools menu, select Change Password
2. The Change Password dialog box appears.
3. Enter current password, and new password.
4. Click **OK** to confirm.

Changing the Link Password

FA4800 Radio Link is encrypted using Advanced Encryption System (AES) using a 128 bit dynamic key. During the installation process a Link Password must be set. An Initial encryption key is generated. Each time a link is established the Encryption key is validated. If the validation failed the link is established but no service or configuration is allowed. In this state the user can change the link password of each of the sites.

➤ **To change the Link Password:**

1. From the Configuration dialog box, select the **Security** tab
2. Click **Change** next to the Link Password field box.
   The Change Link Password dialog box appears.
3. Enter the current link password.
4. Enter the new password.
5. Enter the new password again in the Confirm box.

Forgotten the Link Password

In case of a forgotten link password, the user may enter the key password supplied with the product. The key password may be obtained from customer support after validation of the device serial number or MAC address. The user may change the link password of both sides of the link at any time using the Link Configuration Wizard.

➤ **To enter the key password:**

1. From the Configuration dialog box, select the **Security** tab.
2. Click **Change** next to the Link Password field box.
   The Change Link Password dialog box appears.
3. Click the **Forgot Link Password** button.
   The Key Link Password dialog box appears.
4. Type the key link password.
5. A new link password may now be set.

4.14 Muting the Beeper

The ODU beeper starts beeping as soon as power is supplied, and continues until the ODUs are aligned and the link established.

It is possible to mute the beeper until the alignment procedure is to be performed.

➤ **To mute the beeper:**

1. Click on **Configuration** in the Menu bar and select the relevant site.
   The Configuration dialog box opens.
2. In the Configuration dialog box, click the **Buzzer** button. The button toggles between on and off.
3. The Beeper stops.

➤ **To restore the beeper:**

1. Click **Configuration** in the Menu bar and select the relevant site.
   The Configuration dialog box opens.
2. In the Configuration dialog box, click the **Buzzer** button. The button toggles between on and off.
3. The Beeper starts.

4.15 Setting External Alarm Inputs

The IDU-C has two external alarm inputs in the form of dry-contact relays. The Alarm interface is located on the front panel of the IDU-C and is a 9-pin D-type female connector, see *Appendix A* for the pinout. The user enables or disables each of the alarms and can configure the text that appears in the alarm trap. The ODU sends the alarm within less than a second from actual alarm trigger.

➤ **To set the external alarm inputs:**

1. Open the Site Configuration Alarms configuration by clicking **Configuration > Advanced.**

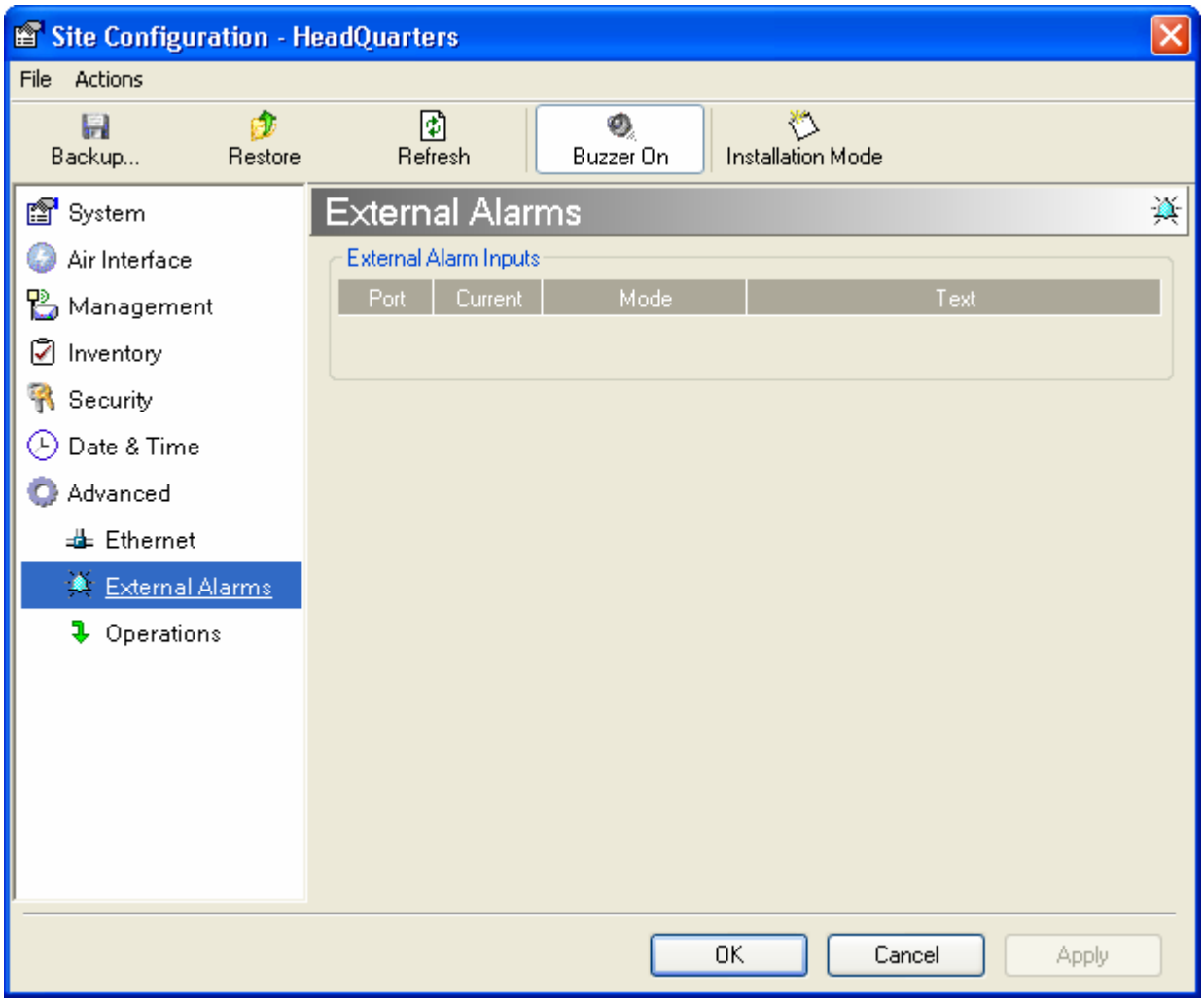


Figure 4-18. External Alarm Configuration

2. Enter a description of the alarms in the fields.
3. Click **Apply** to save.

4.16 Managing Configuration Files

Saving FA4800 Configuration in a File

FA4800 management software allows you to save configuration parameters of the local and remote units on the management station as an INI file. Each site is saved in a separate INI file.

➤ **To save the configuration in a file:**

1. Click **Configuration** from the main menu.
2. Select which site to backup.
   The configuration dialog box opens.
3. Click **Backup**.
4. In the Save As dialog box, indicate in which folder and under what name configuration file is to be saved, and click **Save**.

Restoring a Configuration File

Configuration files (***.ini**) can be uploaded from the management station. Verified configuration files can be distributed to other units that use the same configuration.

➤ **To restore a configuration file:**

1. From the **Configuration** menu, select the site to reconfigure.
   The Configuration dialog box opens.
2. Click **Restore**.
3. From the Open dialog box select ***.ini** file to upload and click **OK**.

4.17 Reinstalling the Link

It may be necessary to reinstall the link if the ODUs should need to be realigned.

Note

Reinstalling the link causes both sites to go into install mode.

➤ **To reinstall the link:**

1. Click **Configuration** in the Menu bar and select any one of the sites.
   The Configuration dialog box opens.
2. Click the **Install Mode** button in the Configuration dialog box.
   A message box asking if you want to enter install mode appears.
3. Click **Yes** to continue.
   FA4800 enters install mode and the beeper starts beeping.
4. Realign the ODUs and complete the Installation wizard (see *Chapter2*).

4.18 Resetting FA4800

Note *Resetting the link causes service disconnection.*
In order to maintain the link configuration, reset the remote FA4800 first.

➤ **To reset FA4800:**

1. From **Maintenance,** reset the remote FA4800.
2. From **Maintenance,** reset the local FA4800.

➤ **To reset to Factory Defaults**

1. Click **Configuration** in the Menu bar and select any one of the sites.
   The Configuration dialog box opens.
2. Select **Operations** in the Configuration dialog box.
3. Click the **Restore Defaults** button.
   A message box asking if you want to restore factory default appears.
4. Click the check box if you want to keep the current IP settings.
5. Click **Yes** to continue.

4.19 Displaying the Inventory

➤ **To view the inventory data**

1. Click **Configuration** from the main menu.
2. Select which site to configure.
   The configuration dialog box opens.
3. Select Inventory (*Figure 4-19*).

Note *This screen is for viewing purposes only.*

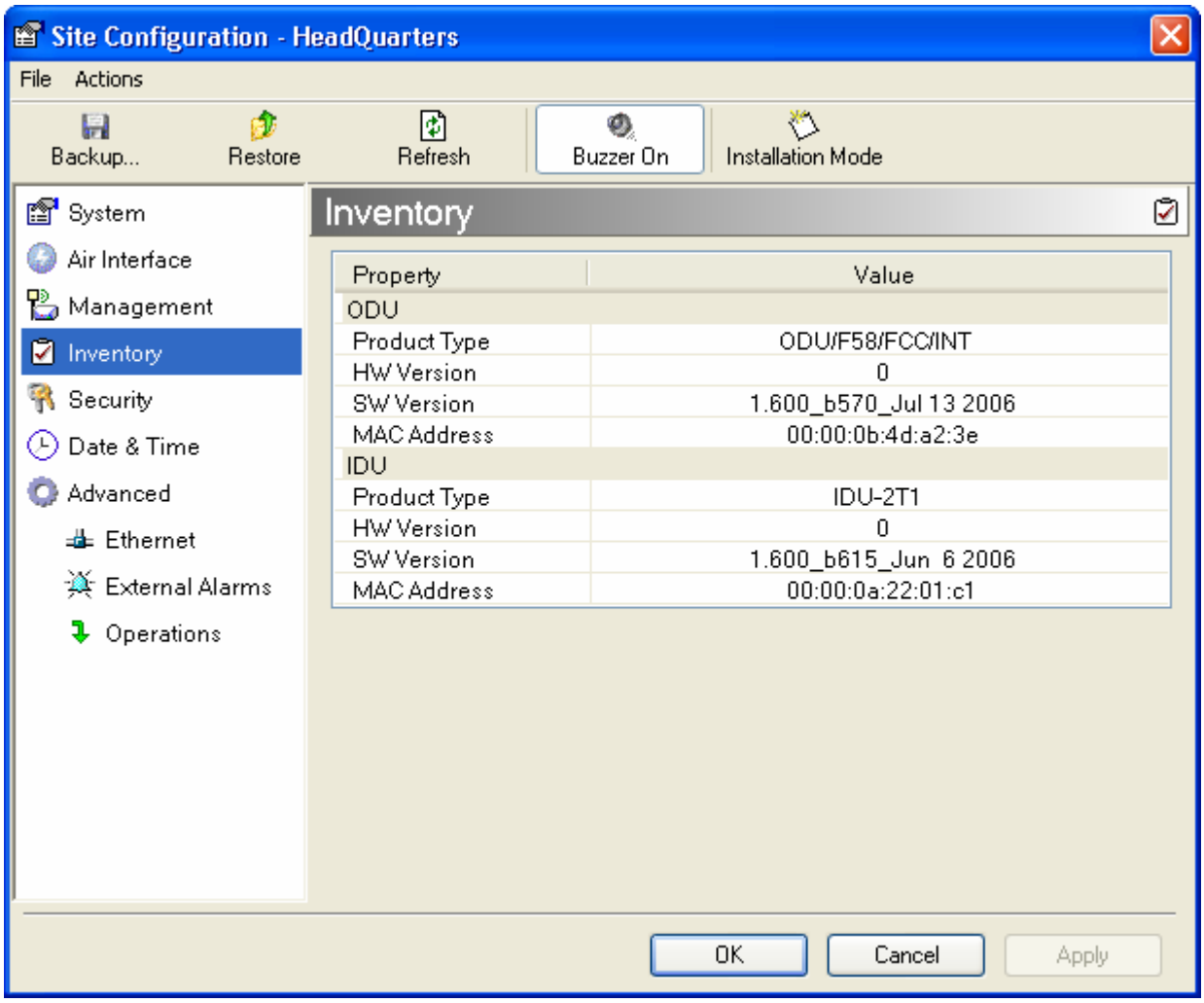


Figure 4-19. Inventory Screen

Chapter 5

Diagnostics and Troubleshooting

This chapter describes the FA4800 diagnostic functions, which include:

- Monitoring Performance
- Error detection and alarms
- Diagnostic tests (local and remote loopbacks on E1 or T1 link)
- Troubleshooting
- Frequently asked questions.

5.1 Automatic Link Data Collection (Get Link Information)

The Get Link Information feature collects all the link and Manager information which can be used for diagnostics.

In the event of needing to contact technical support please send this file so as to speed up the assistance.

➤ **To get link information**

1. Click **Help** on the menu bar, select **Link Information**.

   The Get Link Information dialog box appears. See *Figure 5-1*.

2. Select or deselect the data options. If the file is to be sent to Technical Support leave all options checked.
3. Click **File Path** to get to the directory to save the file in.
4. Click **Start** to save the information.

   The file is saved as **Link Information.txt**

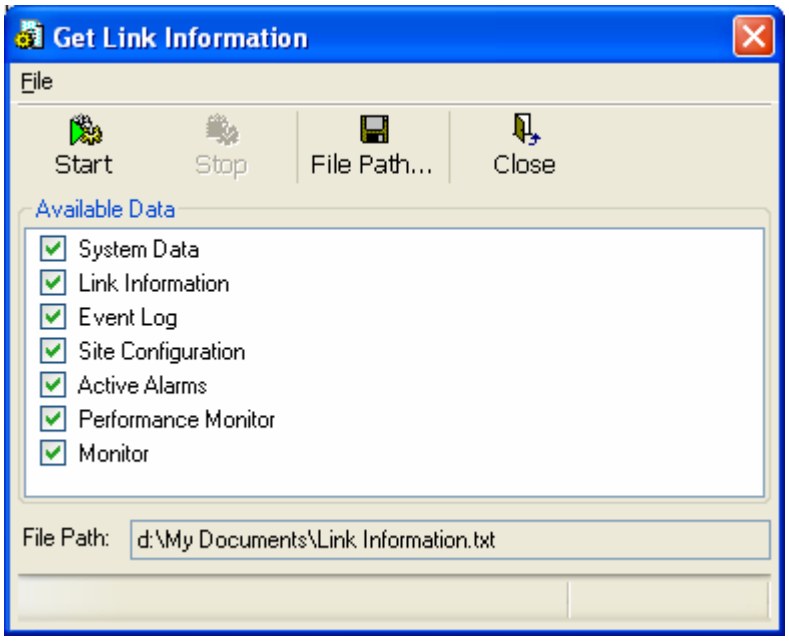


Figure 5-1. Get Link Information

5.2 Monitoring Performance

FA4800 constantly monitors traffic over the radio link and collects the following statistics data:

- Site 1/Site 2 received traffic rate (in Mbps)
- Site 1/Site 2 received frames rate (in Mbps)
- Radio signal strength (in dBm)
- Error (Blocks).

The statistics (monitor) log and event log can be saved as TXT files. New alarms are automatically added to the text file, as they enter the event log.

Saving the Monitor Log

➤ **To save the monitor log**:

1. From the Tools menu, choose **Preferences**.

   The Preferences dialog box appears (see *Figure 5-2*).
2. Click the **Monitor** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.
5. Click the ... button and in the Select File dialog box indicate in which folder and under what name the alarm log file is to be saved.
6. Set the time interval for adding data to the file.

7. Click **OK** to save the file

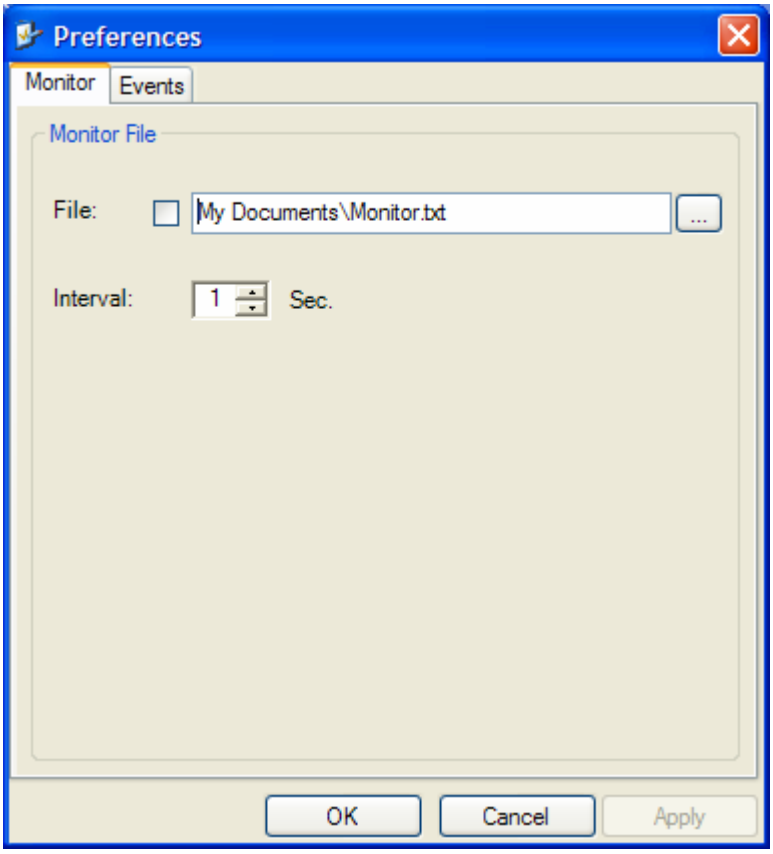


Figure 5-2. Preferences Dialog Box, Monitor Tab

Setting the Events Preferences

You can define a color that the traps are displayed in the monitor pane, according to severity of the event. The severity is predefined.

➤ **To set the trap color:**

1. From the Tools menu, choose **Preferences**.
   The Preferences dialog box appears).
2. Click the **Events** Tab (see *Figure 5-3*).
3. Select the Event priority type and click on the ... button.
   A color chart opens.
4. Select the desired color.
5. Repeat for all the trap types.

➤ **To set the trap background color:**

- Click **Background Color** to change the text background.

➤ **To reset the trap colors:**

- Click **Reset Settings** to return to the default color settings.

Saving the Events Log

➤ **To save the event log**:

1. From the Tools menu, choose **Preferences**.
   The Preferences dialog box appears (see *Figure 5-3*).
2. Click the **Events** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.
5. Click the ... button and in the Select File dialog box indicate in which folder and under what name the alarm log file is to be saved, and click **OK**.

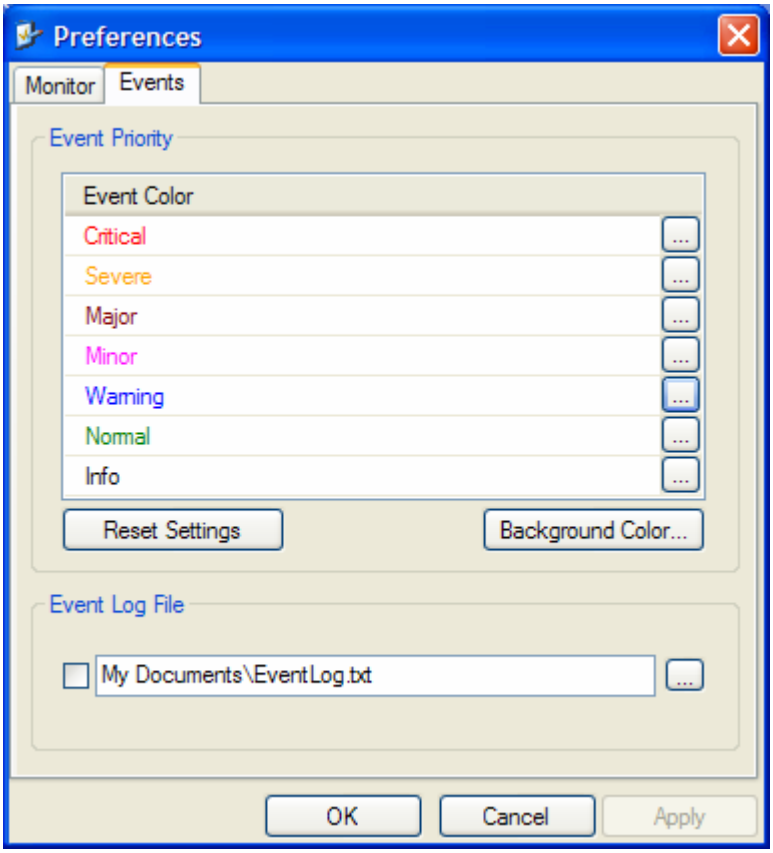


Figure 5-3. Preferences Dialog Box, Event Log Tab

5.3 Viewing Performance Reports

The Performance Monitor Report displays performance views of each of the interfaces[1] (see *Figure 5-4*). Several performance data are collected for each of the interfaces (ES, SES, and UAS), as well as Specific data per Interface type (e.g., TX

[1] Ethernet performance is not collected in PoE systems.

and RX bytes for Ethernet). For the Air Interface, user defined thresholds data are collected. Refer to *Table 5-1* and *Table 5-2*.

Data is collected and selectively displayed based on three time intervals as selected by the **Interval** radio buttons:

- Current (t=0)
- 15 minutes Intervals
- Daily.

The most important parameter is the UAS. This parameter counts the time the air link was not providing any service. There are several potential reasons for this situation; one of the sites has a power failure, high interference, maintenance operation etc.

The next important parameter is the Radio BBER Threshold. This parameter counts the seconds in which the radio performance is below a user specified threshold. The threshold is measured in percent. The threshold can be set from 0.1% up to 50%.
For links with E1/T1 service the recommended value is 1% (Which is the system default). Excellent TDM service, is expected below the 1% threshold, meaning that for 1% threshold, the expected BBER value should be 0 if there are no problems during the 15 min interval. When the BBER threshold increses some degraded service might be noticed.
For links with Ethernet only service, 8% threshold is recommended and not 1% (Which is the system default) meaning that for 8% threshold, the recommended BBER value should be 0 if there are no problems during the 15 min interval. Since FA4800 provides a loss less Ethernet service, there is throughput degradation in case of interference. The degradation is proportional to the BBER.

Radio RSS Threshold can also be used to indicate problems in the radio channel. After verifying the RSS according to the link budget calculator during the installation (see installation manual). A value of -5dB from the current RSS is recommended as a threshold.

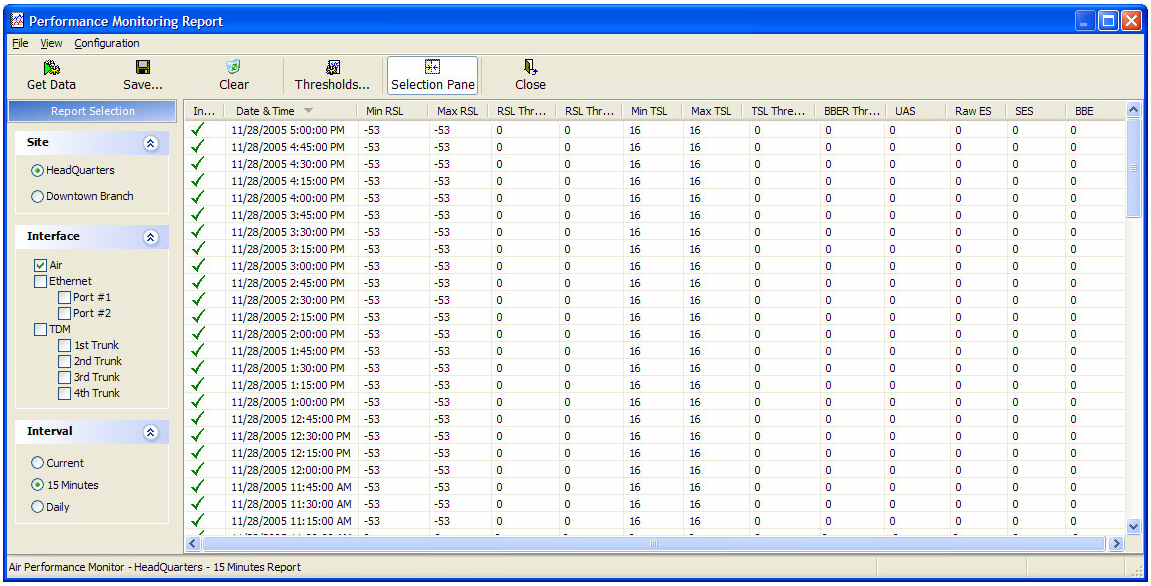


Figure 5-4. Performance Monitoring Report window

Table 5-1. Explanation of performance data

Data type	Reported value	Explanation
Generic PM Data	UAS – Unavailable Seconds	Seconds in which the interface was out of service.
	ES – Error Second	The number of seconds in which there was at least an error block. Note that notation of an error block is different per interface.
	SES – Severe Error Second	The number of seconds in which the service quality is low (the actual BBER ratio varies per interface).
	BBE – Background Block Error	The number of error block in an interval.
	Integrity	A flag indicating that the data is valid. Note that the PM data is not valid if not all the values were stored[2].
Air Interface PM Data	Max RSL	The maximum of the receive signal level (measured in dBm).
	Min RSL	The minimum of the receive signal level (measured in dBm).
	Max TSL	The maximum of the transmit signal level (measured in dBm)[3].
	Min TSL	The minimum of the transmit signal level (measured in dBm).
	RSL Threshold 1	This parameter counts the number of seconds in which the RSL is below the specified threshold.
	RSL Threshold 2	This parameter counts the number of seconds in which the RSL is below the specified threshold.

[2] Possible reasons are: Clock changes within the interval and Power up reset

[3] The transmit power is fixed. The value can be changed only by user configuration

Data type	Reported value	Explanation
	TSL Threshold 1	This parameter counts the number of seconds in which the RSL is above the specified threshold.
	BBER Threshold	The BBER Threshold value counts the number of seconds in which the Background Block Error Ratio (BBER) exceeds the specified threshold. Note, that the system is design for excellent quality of service with BBER of less then 1%. (at 1% BBER expected TDM BER is less than 1E-6.
Ethernet Interface PM Data	Received Bytes	The number of Mega bytes received in the specified port within the interval
	Transmitted Bytes	The number of Mega bytes received in the specified port within the interval.

Table 5-2. Action of the tool bar button commands

Button	Action
Get Data	Uploads the selected report from the ODU.
Save	Saves the data in a CSV or Text format for additional analysis.
Clear	Removes the current data from the window.
Selection pane	Selects the site, interface, and interval to be displayed.
Threshold	Opens the threshold configuration dialog box (Figure 5-5) to set the Air Interface thresholds. Note that threshold change is effected immediately, but it does not change any historical data.
Close	Closes the Performance Monitor Report window.

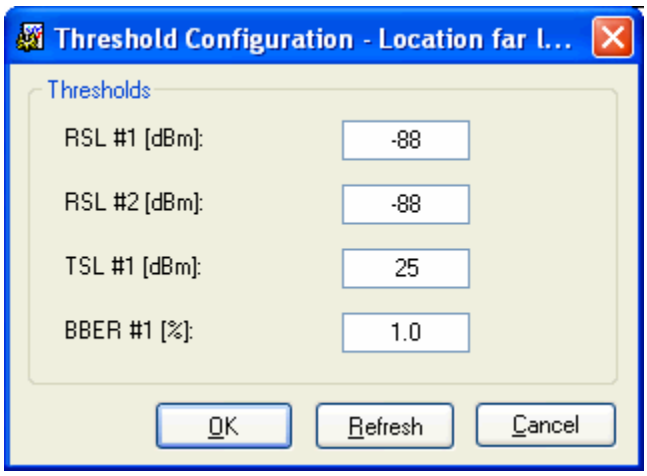


Figure 5-5. Threshold configuration dialog box

5.4 Error Detection and Alarms

FA4800 detects fault conditions of the radio and user links and initiates alarms to alert the user.

Note *To store the event log, first define the IP address, subnet mask, default gateway and trap address of the management PC, see Chapter 4 for details.*

Alarms (traps) are displayed in the Event Log in the lower panel of the Main Menu screen. The alarm log is saved as a TXT file.

The event log includes the following fields:

- Sequential number (ID)
- Date and time stamp
- Message
- Trap source
- IP address of the ODU that initiated alarm.

Table 5-3. FA4800 Alarms and Information Messages

Message	Description
Radio Link – Sync	Radio link is synchronized
Radio Link – Out Of Sync	Radio link lost synchronization
Link Has Been Reset	ODU was reset due to internal problem
TDM Interface – Normal	TDM interface is operating properly
TDM Interface – LOS	Loss of Synchronization is reported by TDM interface
TDM Interface – LOS	Loss of Signal is reported by TDM interface
TDM Interface – AIS	Alarm Indication Signal is reported by TDM interface
TDM Interface – Loopback	A loopback is active on TDM interface
Link Resetting	Wireless link reset from the management station. This alarm is caused by automatic reset after link configuration.
Local ODU Resetting	The local ODU reset from the management station.
Monitor was stopped since no connection to the link	No ODU-to-IDU traffic was detected during the last 20 minutes.
TDM Service – Normal	TDM service is operating properly
TDM Service – Alarm	Error has been detected on a TDM line
Configuration problem detected	The link needs to be reinstalled
Channel Scanning in progress	The ODU is scanning the channels for the remote ODU
Transmitting on <frequency> GHz	The ODU is transmitting on the frequency channel listed
Radar activity was detected in <site>, on channel <frequency> GHz	For DFS versions only. Radar is detected; the channel is prohibited for 30 minutes.
Monitoring fo Radar activity on channel <frequency> GHz	For DFS versions only. ODU is looking for Radar activity.
Bit Failed indication	Indicates ODU hardware problem. Send error code to Technical Support.
Link Status	Indicates incorrect connection or operation with the link. For example link out of range. Available in 1.620 versions and above.
Site Status	Indicates incorrect connection or operation at the site. Available in 1.620 versions and above.

➤ **To view summary of saved alarms**

- From the Tools menu, choose **Active Alarm Summary**.

  The Active Alarms Summary window opens. See *Table 5-4*; for an explanation of the command buttons.

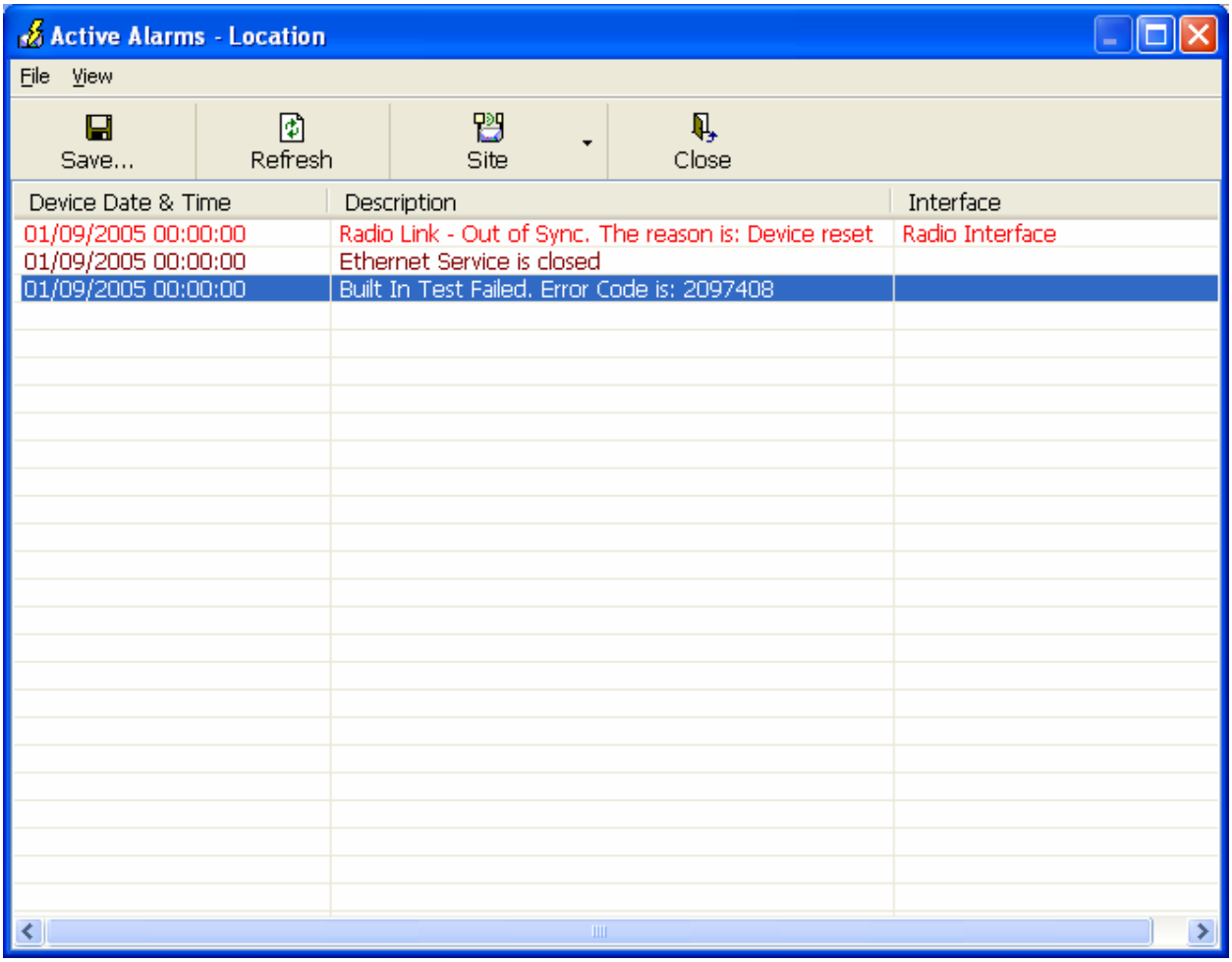


Figure 5-6. Active Alarms Summary

Table 5-4. Active Alarms command buttons

Command	Action
Save	Saves the alarms in CSV or text format for further analysis.
Refresh	Reads the alarms from the ODU, and displays the alarms.
Site	Selects site for the active alarms.
Close	Closes the active alarm window.

5.5 Testing FA4800

FA4800 supports activation of the internal and external loopbacks on the local and remote units.

➤ **To activate a loopback**:

1. From the Maintenance menu, choose **Set Loopbacks**.

   The Loopbacks dialog box appears (see *Figure 5-7*).

2. From the Local or Remote drop-down box, select a loopback that you intend to run, and click **OK**.

   A confirmation message appears.

3. Click **OK** to activate a loopback.

   FA4800 activates selected loopback. A loopback status arrow in the Main menu turns green to indicate an active loopback.

➤ **To deactivate a loopback**:

- From the From the Local or Remote drop-down box of the Loopbacks dialog box, select **None** and click **OK**.

  A loopback is deactivated and the corresponding status arrow in the Main menu becomes dimmed.

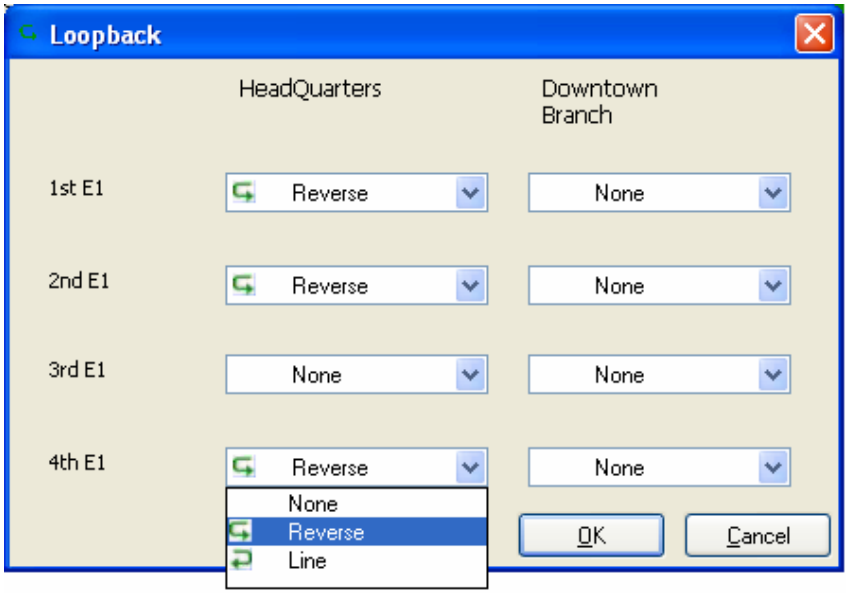


Figure 5-7. Loopbacks Dialog Box

Local External Loopback

Local FA4800 can be set to an external loopback to test the local E1/T1 port and its connection to the local side user equipment. In this mode, data coming from the local user equipment is looped back to it (see *Figure 5-8*). This loopback is initiated from a management station connected to the local unit.

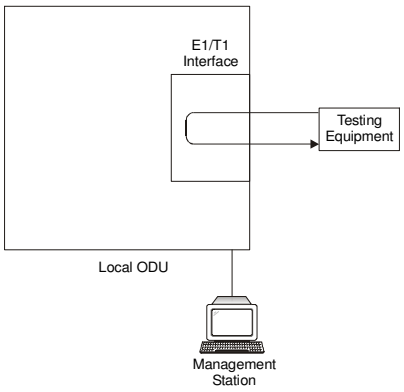


Figure 5-8. Local External Loopback

Remote Internal Loopback

Remote FA4800 can be set to an internal loopback to test connection between the local and remote units, the local E1/T1 port and its connection to the local side user equipment. In this mode, data coming from the local FA4800 is looped back to it (see *Figure 5-9*). This loopback is initiated from a management station connected to the local unit.

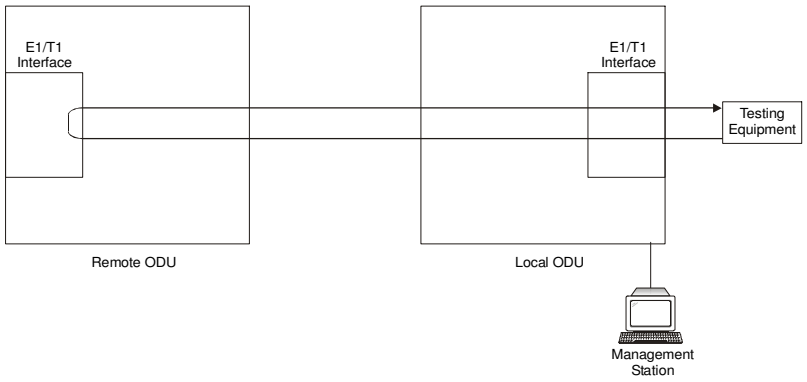


Figure 5-9. Remote Internal Loopback

Remote External Loopback

Remote FA4800 can be set to an external loopback to test the remote E1/T1 port and its connection to the remote side user equipment. In this mode, data coming from the remote user equipment is looped back to it (see *Figure 5-10*). This loopback is initiated by an inband command sent from a management station connected to the local unit.

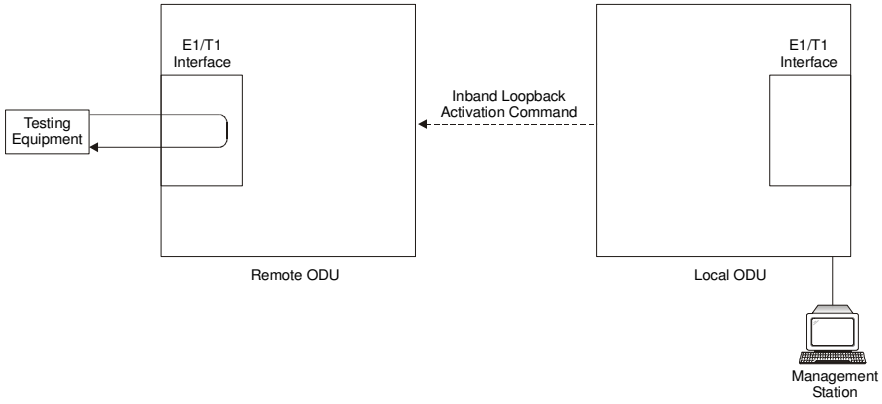


Figure 5-10. Remote External Loopback

Local Internal Loopback

Local FA4800 can be set to close an internal loopback to test connection between the local and remote units, remote E1/T1 port and its connection to the remote side user equipment. In this mode, data coming from the remote user equipment is looped back to it (see *Figure 5-11*). This loopback is initiated by an inband command sent from a management station connected to the local unit.

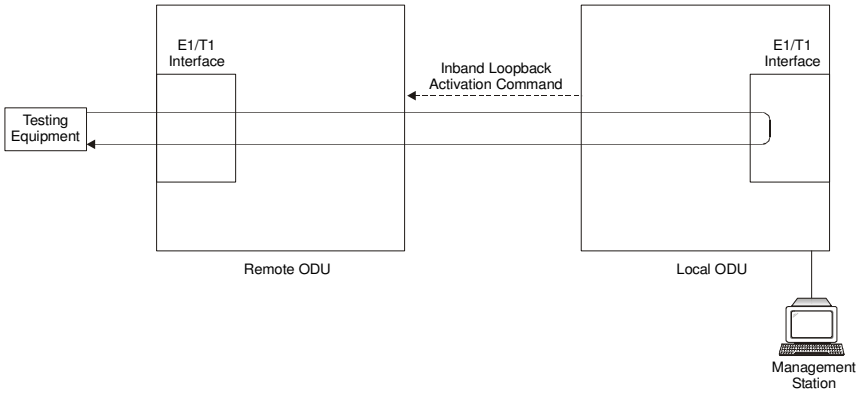


Figure 5-11. Local Internal Loopback

5.6 Troubleshooting

Use *Table 5-6* and *Table 5-6* to diagnose any faults in the system.

Table 5-5. Troubleshooting

Symptom	Remedy

No power	Verify that AC power is connected to the IDU.
	Verify that the ODU cable is properly wired and connected.
No signal	Complete the installation procedure from the management software.
	Verify the ODU alignment. Check that the radio configuration of both site A and site B units are the same (channel and SSID).
Weak signal	Verify the ODU alignment, reconfigure the link.
	Verify the beeper sounds the Best Signal sequence.

The FA4800 LEDs show faults in the system or the link.

Table 5-6. Troubleshooting with FA4800 LEDs

LED	Status	Remedy
PWR	Off	Check that AC adapter is connected to the IDU-E and the AC power outlet.
IDU	Orange	Check that the IDU/ODU cable is properly wired and connected.
ODU	Red	Check that the IDU/ODU cable is properly wired and connected.
AIR I/F	Orange	Complete the installation procedure from the management software.
	Red	Check the ODU Antenna alignment. Check that the radio configuration of both site A and site B units are the same (channel and SSID).
SERVICE	Off	Check the TDM service configuration in the NMS.
	Orange	Check that the system is not in loopback mode. Check the site B IDU ports and cables and site B external equipment.
	Red	Check the site A IDU ports, cables and external equipment.

5.7 Frequently Asked Questions

Q: What performance issues will arise due to environmental conditions?

A: FA4800 is not sensitive to environmental conditions. However if heavy rain or snowfall is expected ensure the performance by allowing a higher fade margin in the link budget planning calculations.

Q: When using the FA4800, what is the potential for interference between our system and other cellular or wireless Networks devices?

A: The FA4800 is a robust system. However since it operates in unlicensed band there maybe some interference. Nevertheless, the fact that we can manually set the frequency gives us the flexibility to find a clear channel. In addition each FA4800 link uses unique user configurable SSID code.

Q: What protocol does the FA4800 use, i.e. 802.11?

A: **FA4800** uses a proprietary protocol; this protocol contains improved options that more efficiently support the clock reconstruction from the TDM services.

Q: What type of security is offered on FA4800?

A: FA4800 has three levels of security:

1. AES hardware mechanism
2. Each unit uses a unique SSID link-specific code (up to 24 alphanumeric characters)
3. Proprietary protocol protects from eavesdropping from other systems.

Q: Can we use horizontal and vertical polarization on the same frequency to double the number of wireless links?

A: Installing two FA4800 systems in the same band with cross polarization provides 20–25 dB separations. Nevertheless, since there are reflections, the cross polarization separation is decreased and spatial separation is recommended.

Q: Could you add the frequency of 5.735 to the manual selection in order to increase the number of 20 MHz channels to six?

A: Currently the system provides fixed channels, with one manual frequency setting. The manual setting provides flexibility of spectrum selection, including 5.735 MHz.

Q: Can we mange FA4800 using SNMPc other than the supplied management software that comes with the units?

A: Yes. The FA4800 is SNMP-based. FA4800 can be managed when using other SNMP software after implementing CERAGON MIB's.

Q: Can FA4800 be managed and configured via Telnet?

A: No. Use only the FA4800 software manager.

Q: Can I use FA4800 with any vendor's external antenna?

A: Yes. CERAGON supplies the FA4800 external ODU with an N-type typical connector. Any vendor's external antenna that can be cascaded to our external unit can be used without problem. Please note that dB losses in the cascading cable between the external ODU and antenna should be taken into consideration. (In the supplied cascading cable of one meter we have 1 dB loss)

Q: Do we need to add external arrestors on FA4800 cables?

A: The FA4800 ODU includes arrestors and lightning protection. Therefore there is no need to add additional arrestors.

Q: What is the actual Ethernet data rate and maximum throughput?

A: The maximum net throughput of FA4800 is full duplex 18 Mbps.

Note *FA4800 is a symmetrical system*

Q: What is the sensitivity for each rate of the FA4800?

A: The rate sensitivities are:

Rate [Mbps]	**Sensitivity** [dB]
12	-84
18	-81
36	-74
48	-68

Q: Does FA4800 withhold any MAC Addresses?

A: The FA4800 is a layer 2 Bridge (VLAN transparent). The built-in switch contains a MAC Address table up to 2047.

Q: Can I use any category 5e cable in order to connect the IDU and ODU?

A: The cable should be suitable for outdoor use, and shielded Category 5e.

Q: What are the BER values expected in the FA4800 link?

A: 10-11 (according to BER sensitivity threshold)

Q: Does FA4800 use DSSS technique?

A: No, FA4800 uses the advanced OFDM technique.

Q: What are the main advantages of the FA4800 solution (e.g., wireline, wireless, etc.) over other possible alternatives?

A:

- Easy and intuitive installation using audio indication.
- Easy configuration using the management software of overall link site-to-site, there is no need to travel between the two sites in order to change the configuration.
- Easy migration between transition channels site-to-site.
- Full backup option – backup and restore using ini files.
- Very light ODU (1.5 kg).
- No RF loses between IDU and ODU.
- Robust Air Interface Layer 2 ARQ insures “error-free” Ethernet service even in harsh conditions. Retransmit mechanism for TDM esures low BER.
- Integrated up to 4 E1/T1 and Ethernet radio over one single product.
- Supports a variety of applications Voice and Data over single radio – no need for external mediation device.
- Smooth migration to VoIP applications.
- Carrier class compliant with ITU standards for E1 and T1.
- Low and constant TDM latency (8 msec).
- Extremely accurate recovered clock low cost replacement to PDH radios.

5.8 Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

For further information, please contact the CERAGON distributor nearest you or one of CERAGON's offices worldwide. This information can be found at www.ceragon.com.

Appendix A
Wiring Specifications

A.1 ODU-IDU Cable

The ODU-IDU cable is standard CAT-5, 4 twisted-pair 24 AWG FTP, terminated with RJ-45 connectors on both ends. It is covered by a cable gland on the ODU side for hermetic sealing.

Table A-1 shows the connector pinout.

Table A-1. ODU-IDU Cable Connector Pinout

IDU RJ-45		Wire Color	Function	ODU RJ-45
1	twisted	White/Green	Ethernet (RxN)	1
2	pair	Green	Ethernet (RxT)	2
3	twisted	White/Orange	Ethernet (TxT)	3
6	pair	Orange	Ethernet (TxN)	6
4	twisted	Blue	Power (+)	4
5	pair	White/Blue	Power (+)	5
7	twisted	White/Brown	Power (–)	7
8	pair	Brown	Power (–)	8

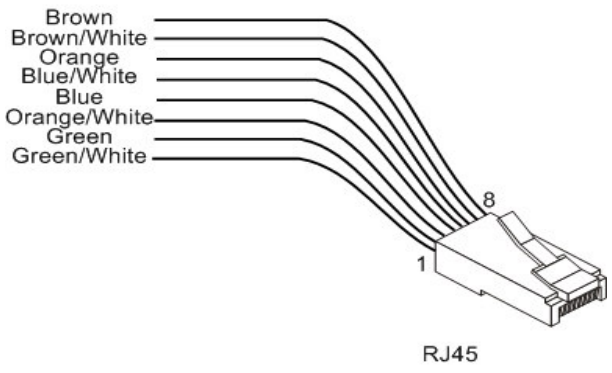


Figure A-1. RJ-45 wiring for IDU-ODU cable

A.2 User Port Connectors

The IDU includes ports for connecting E1/T1 and 10/100BaseT Ethernet user devices.

Trunk Port

The Trunk (E1/T1) interface terminates in an 8-pin RJ-45 balanced connector, wired in accordance to *Table A-2*.

Table A-2. E1/T1 Connector Pinout

Pin	Function
4,5	Receive (input)
1,2	Transmit (output)

LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to *Table A-3*.

Table A-3. Fast Ethernet Connector Pinout

Pin	Signal	Function
1	TD (+)	Transmit Data (positive)
2	TD (–)	Transmit Data (negative)
3	RD (+)	Receive Data (positive)
6	RD (–)	Receive Data (negative)

A.3 IDU-C Connectors

IDU-C DC Power Terminal

Table A-4. Terminal Block 3-pin -48VDC

Pin	Connection
Right	+
Center	Chassis
Left	–

IDU-C Alarm Connector

Table Table A-5 lists the alarm connector pinout.

Table A-5. Alarm Connector (Dry-Contact)

Pin	Description	
1	Input 1	Positive
6	Input 1	Negative
2	Input 2	Positive
7	Input 2	Negative
3	Output 1	Normally Closed
8	Output 1	Common
4	Output 1	Normally Open
9	Output 2	Common
5	Output 2	Normally Open

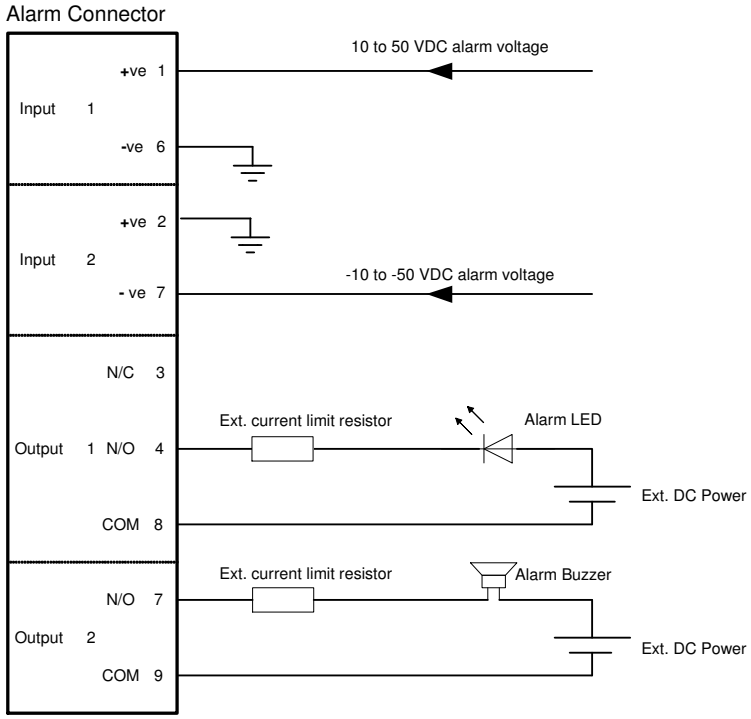


Figure A-2. Example for connecting the alarm connector

Appendix B
Mast and Wall Installation

B.1 Mounting the ODU

The ODU can be mounted on a mast or a wall.

ODU Mounting Kit Contents

The ODU mounting kit includes the following items:

- One Large Clamp (see figure B-1)
- One Small Clamp (see figure B-2)
- One Arm (see figure B-3)
- Four Screw hex head M8x40
- Two Screw hex head M8x70
- Four Washer flat M8
- Three Washer spring M8
- Two M8 Nuts.

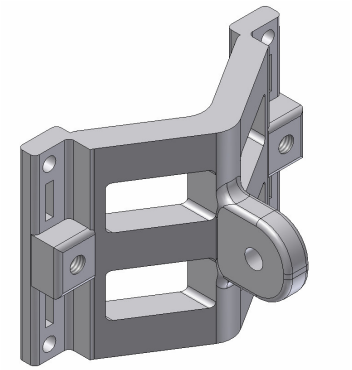


Figure B-1. Large Clamp

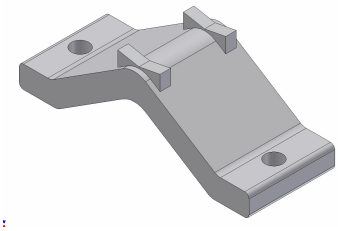


Figure B-2. Small Clamp

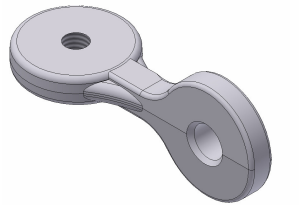
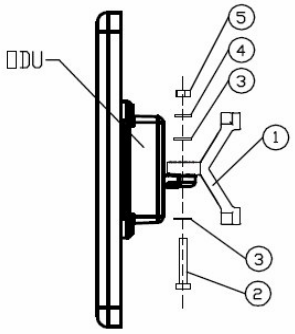


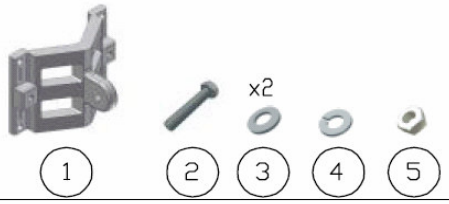
Figure B-3. Arm

Mounting FibeAir 4800 on a Mast



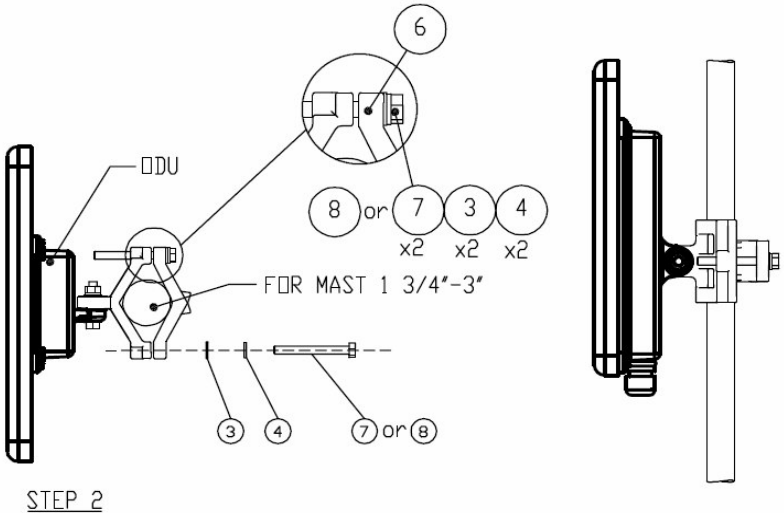
Installation Kit

ITEM	DESCRIPTION	QTY
1	Clamp	1
2	Screw hex head M8x40	1
3	Washer flat M8	4
4	Washer spring M8	3
5	Nut M8	1
6	Clamp	1
7	Screw hex head M8x40 (for 1 3/4" dia mast)	2
8	Screw hex head M8x70 (for greater size of mast)	2



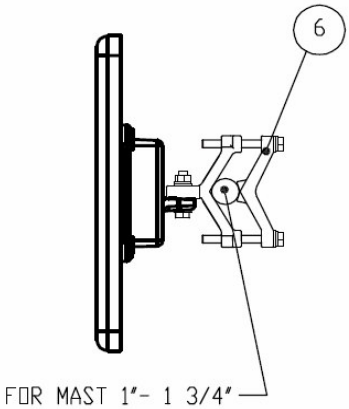
STEP 1

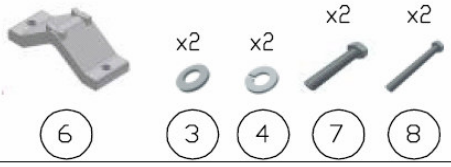
Attach item 1 to the base (mate knurled surfaces) using items 2 ,3 ,4 ,5 as shown Use tightening torque of 24 N/m.



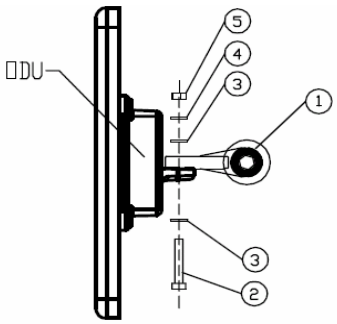
STEP 2

Tighten the antenna to the mast , using item 6, screws, and washers items 7 ,3 ,4 as shown. Use tightening torque of 14 N/m.



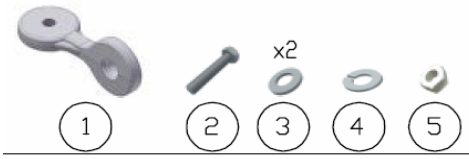


Mounting FA4800 on a Wall

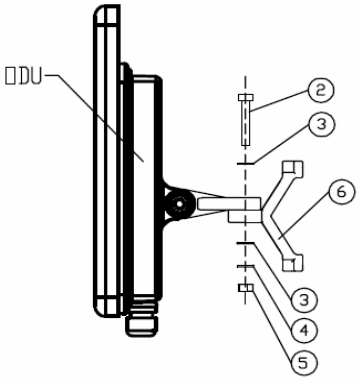


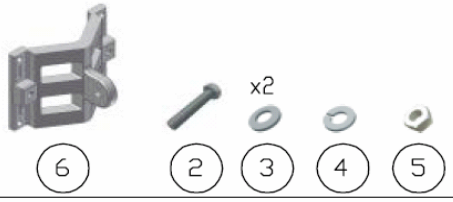
Installation Kit

ITEM	DESCRIPTION	QTY
1	Arm	1
2	Screw hex head M8x40	2
3	Washer flat M8	4
4	Washer spring M8	2
5	Nut M8	2
6	Base wall	1



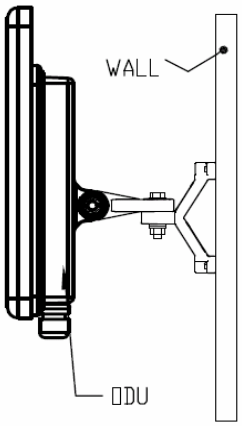
STEP 1
Attach item 1 to the base
(mate knurled surfaces)
using items 2, 3, 4, 5 as shown.
Use tightening torque of 24 N/m.





STEP 2
Attach item 6 to the arm
(mate knurled surfaces)
using items 2 ,3 ,4 ,5 as shown.
Use tightening torque of 24 N/m.

STEP 3
Install ant. to wall
(hardware supplied by customer)



B.2 Mounting an External Antenna

The optional external antenna can be mounted on a mast.

External Antenna Mounting Kit Contents

The external antenna mounting kit includes the following items:

- Twelve flat washers
- Eight spring washers
- Eight hex nuts
- Four bolts
- One U-bracket
- One pivoting bracket
- Two metal strap clamps.

➤ **To install external antenna on the mast:**

1. Attach the U-bracket to the back of the antenna using four flat washers, four spring washers and four hex nuts.
2. Attach the pivoting bracket to the U-bracket using eight flat washers, four spring washers, four hex nuts and four bolts.
3. Pass both strap clamps through the vertical slots in the pivoting bracket.
4. Attach the antenna to the mast using the two strap clamps.
5. Adjust the required tilt using the angular scale and tighten all bolts and nuts at the required position.

Appendix A
Link Budget Calculator

1.1 Overview

The Link Budget Calculator is a utility for calculating the expected performance of the FA4800 wireless link and the possible configurations for a specific link range.

The utility allows you to calculate the expected RSS of the link, and find the type of services and their effective throughput as a function of the link range and deployment conditions.

The Link Budget Calculator is supplied on the FA4800 Manager CD. After installation, it may also be accessed from the menu bar of the WinLink Manager (see Figure A-1).

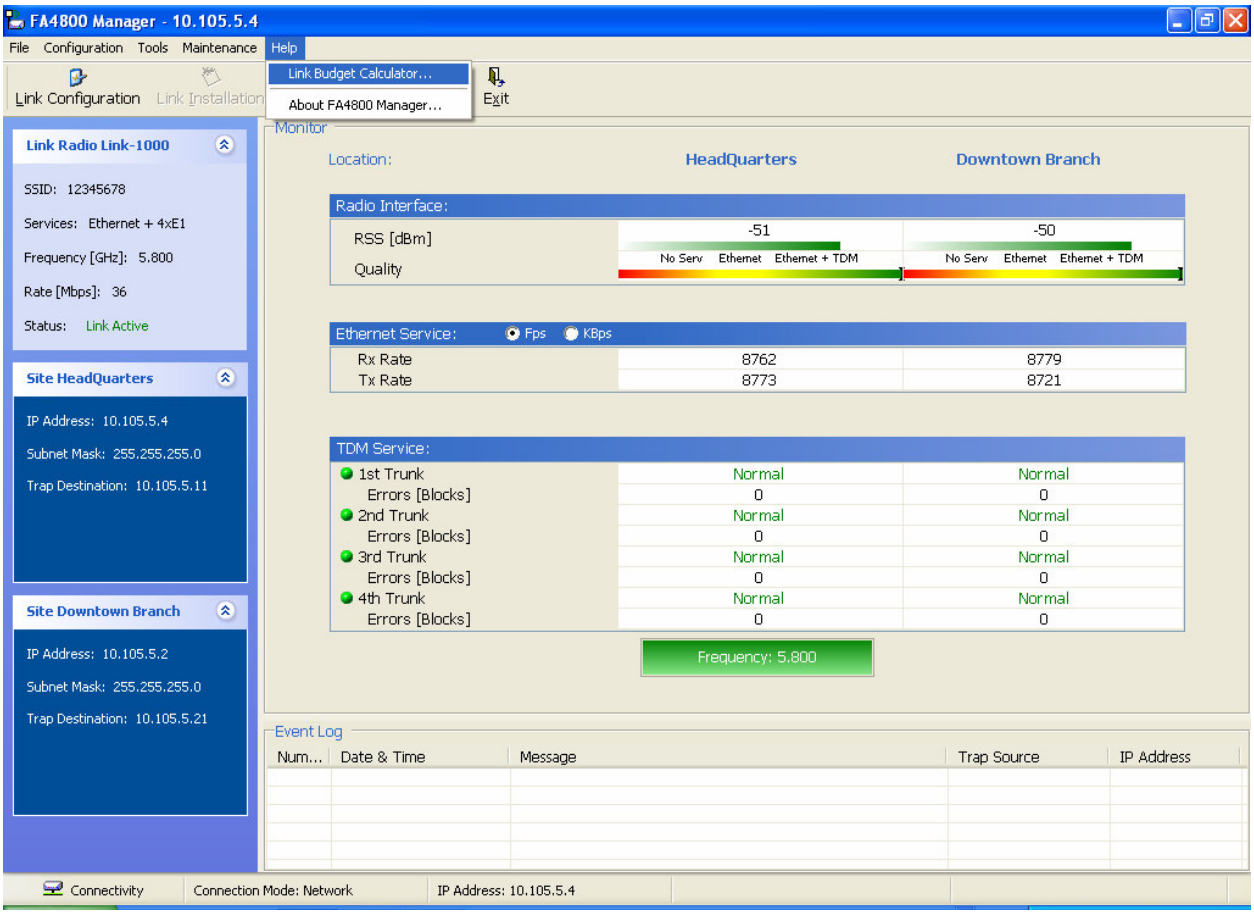


Figure A-1. Accessfsing the Link Budget Manager Calculator

1.2 Using the Link Budget Calculator

The Link Budget Calculator comprises of one table where all the link parameters are defined.

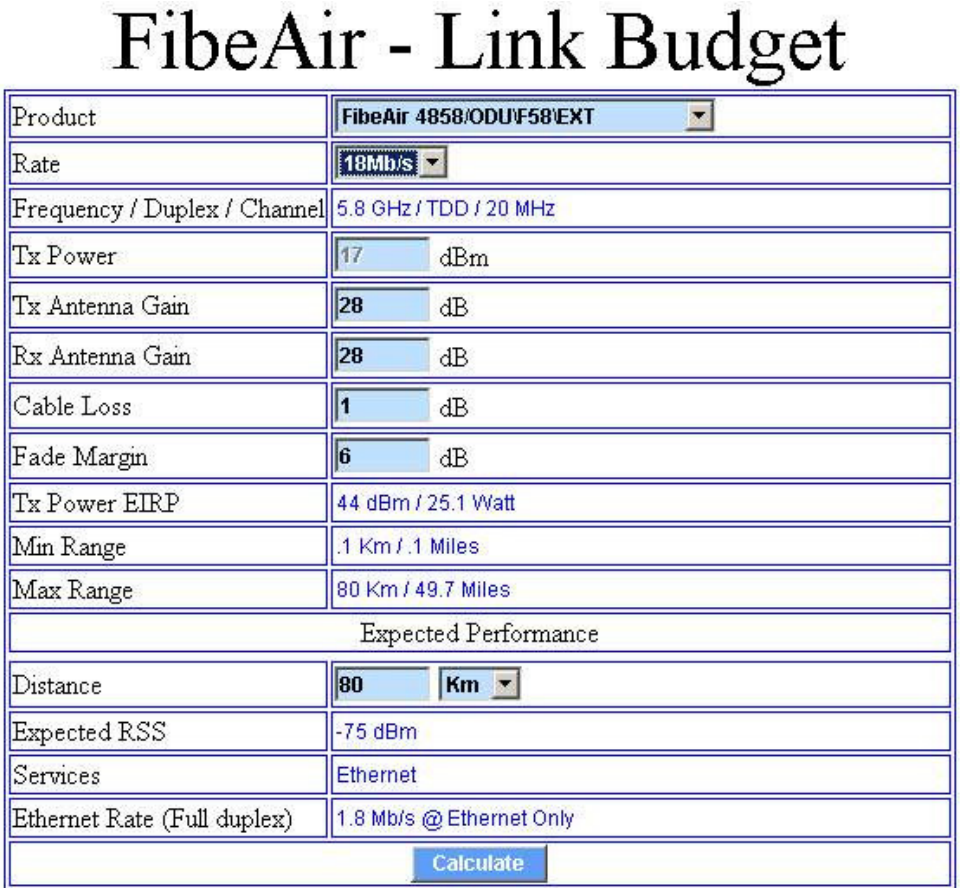


Figure A-2. Link Budget Screen

➤ **To calculate the link budget**

1. Select your WinLink system product from the dropdown list of products.
2. Select the rate from the dropdown list. The rate defines the air-interface rate in Mbps. The system operates in TDD mode and has overhead of the air-interface protocol and therefore the accurate actual throughput is provided in the 'Service' Row and the effective Ethernet throughput is provided in the 'Ethernet Rate'.

Note *Throughput can be decreased as a function of range due to propagation delay.*

The remaining fields are completed automatically depending on the product selected in the product field. Standard FA4800 system parameters are entered as default. Fields in blue boxes may be edited if non-standard antennas and cables are used.

The Fade margin is the minimum margin that is required for LOS conditions. For degraded link conditions, a larger fade margin should be taken into account.

The Tx power EIRP for the system is given in dBm and Watts.

3. Type the required link distance and select units of distance, kilometers or miles.
4. Select the general conditions
5. Select the services required
6. Click **Calculate**

   The Expected Performance parameters are calculated and displayed in the lower part of the table.

   - Expected RSS – this is the number that the FA4800 Manager software shows when the FA4800 ODUs are best aligned.
   - Ethernet Rate – Maximum throughput available with the chosen system.
7. If the expected performance is not suitable for your application, select a different data rate and re-calculate.

Appendix D

AIND Antenna Alignment Procedure

Use this procedure when using the all indoor system FA4800-ANID or manually aligning two FA4800 units.

To achieve the best benefit and link budget from the FibeAir installation, the link antennas must be aligned; the two antennas should exactly face each other.

In order to achieve the best performance, the line of sight must be as clear as possible with no obstructions between the two sites.

Prior to attempting FibeAir alignment, install the hardware and software in accordance with the FA4800 Installation and Operation Manual. *Figure D-1* shows the link setup. At least two people are needed to perform the alignment procedures.

Once the alignment is complete, you are able to evaluate the quality of the link.

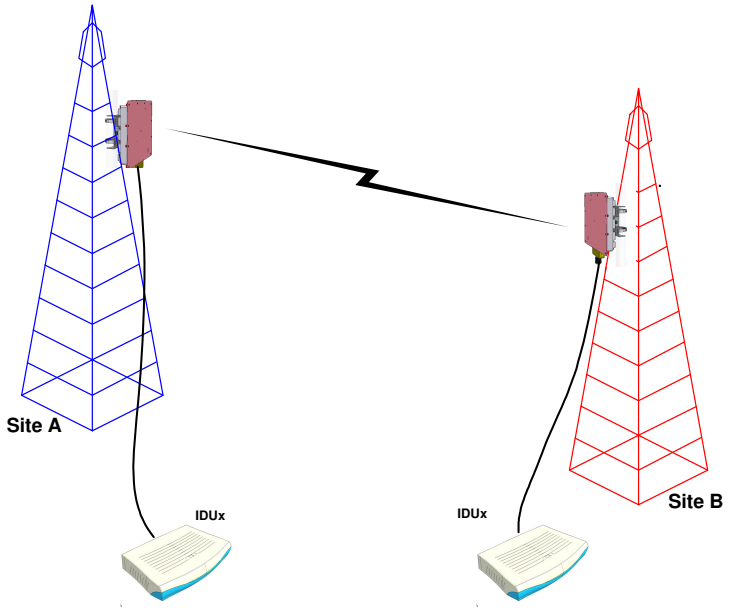


Figure D-1. FA4800 Link Setup

D.1 Expected Signal Level

Based on the link budget parameters of the actual FibeAir sites, you need to calculate the expected signal level that will be received by the receiving site.

Use the Link Budget Calculator utility supplied on the FA4800 Manager Software CD-ROM to calculate the expected performance of the FA4800 wireless link. The utility allows you to determine the RSS of the link, and find the number of E1/T1 services available at various data rates, with the minimum and maximum distance.

D.2 Performing FA4800-AIND Alignment

The supervisor of the antenna alignment is situated at the receive site with the Spectrum Analyzer.

Equipment Setup

➤ **To set up the antenna alignment equipment:**

1. Coarsely align the two antennas. Use the compass readings taken during the Site Survey to point the antennas in the correct direction.
2. Connect the equipment as shown in *Figure D-1* but connect a spectrum analyzer in place of the remote FA4800-AIND.
3. Turn on the CW transmit signal from site A (from the FA4800 NMS).
4. 4. At site B, tune the SA to the frequency transmitted.
5. 5. Increase the SA sensitivity according to the expected receive signal.

Align the antennas:

Note

- *When one antenna is moved, the opposite site is passive*
- *Move the antennas very slowly*

1. Slowly move the site B antenna azimuth axis (the elevation axis should be locked) until you see the best signal on the SA Lock the azimuth axis.
2. Slowly move the site A antenna azimuth axis (the elevation axis should be locked) until you see the best signal on the SA.
   Lock the azimuth axis.
3. Slowly move the site B antenna elevation axis (the azimuth axis should be locked) until you see the best signal on the SA.
   Lock the elevation axis.
4. Slowly move the site A antenna elevation axis (the azimuth axis should be locked) until you see the best signal on the SA.
   Lock the elevation axis.
5. Repeat steps 1 to 4 until the reading on the SA is equal or as close as possible to the calculated receive signal (for Rx Power Level see *Expected Signal Level*).

When the SA reads the expected receive signal, the antennas are aligned and there is an indication of a good link between the sites.

6. Tighten the antenna azimuth axis and elevation axis.
7. Stop the CW function. The NMS will restart the system.
8. Connect FA4800-AIND unit to external antenna. See FA4800 Installation and Operation Manual for details. The operational link is shown in *Figure 2-3*.
9. Configure FA4800 NMS at both sites to operate at the pure channel frequency found in the RF survey. FA4800 is now ready for operation.

D.3 Configuring the Link

1. Run the Installation Wizard in the FA4800 Manager Software to set the configuration of the link. Configure the link in accordance with the parameters calculated in the Link Budget Calculator.
2. FA4800 has a unique identification number, the SSID. Each side of the link looks for its partner with the same SSID. Therefore both sides of the link must be configured with the same SSID.
3. The FA4800 link is now ready for operation.

D.4 Evaluating the Link

With the link operating at a pure channel as determined by the RF survey procedure, the recommended performance threshold of an FA4800 link is the following:

RSS: –84 dBm minimum

There are cases when there is no line of sight, but still the link is of an acceptable quality.

If the link is not within the acceptable limit, see *Troubleshooting*.

D.5 Troubleshooting

If the link is not within the acceptable limit as defined in *Evaluating the Link*, check the following:

- Verify that both antennas have the same polarization (horizontal/vertical).
- Check all the FA4800-AIND cable connectors for faulty connections.
- Verify that there are no obstacles in the Fresnel zone of the antenna path such as large buildings, trees, etc.

- Use a spectrum analyzer with suitable sensitivity to measure the signal at the distance between the sites.

If nothing improves the receive power level, check the overall link.

- Reduce the distance of the link–move the equipment from one site closer to the other site–where it is possible to actually see the antennas with the naked eye.
- If you now get the expected receive signal level, you can assume that the equipment is operational, and the problem arises from interference between the sites.

Appendix E

Antenna Characteristics

An antenna is the radiating and receiving element from which the radio signal, in the form of RF power, is radiated to its surroundings and vice versa. The transmission range is a function of the antenna gain and transmitting power. These factors are limited by country regulations.

FA4800 may be operated with an integrated antenna attached to the ODU unit, or with an external antenna wired to the ODU via an N-type connector. All cables and connections must be connected correctly to reduce losses. The required antenna impedance is 50Ω.

Table E-1. ***Antenna Characteristics***

	Type	Gain [dBi]	Max Range [km]	[miles]	Beam [degrees]	Dimensions [mm]	[in]	Weight [kg]	[lb]	Connector	Lightning Protection
5.8, 5.4, 5.3 GHz											
Integrated	Flat panel	22	40	25	9.0	305×305×58	12×12×2.3	0.5	1.1	NR	Yes
External	Flat panel	28	80	50	4.5	600×600×51	23.6×23.6×2	5.0	11.0	N-type	No
5.8 GHz only											
External	Dish	32.5	80	50	4.5	Dia 900	Dia 35.4	10	22	N-type	No
4.9 GHz											
External	Flat panel	21	24	15	9.0	305×305×58	12×12×2.3	0.5	1.1	N-type	Yes
External	Dish	27	80	50	5	Dia 600	Dia 23.6	5.0	11.0	N-type	Yes
2.4 GHz											
Integrated	Flat panel	17	40	25	20	305×305×58	12×12×2.3	0.5	1.1	NR	Yes
External	Grid	24	80	50	7.5	600×997×380	23.5×39.2×15	2.0	4.6	N-type	No

Parabolic Dish Antenna

The Parabolic dish antenna is a high-gain, reflector antenna used for radio, television, and data communications. The relatively short wavelength of electromagnetic (radio) energy at these frequencies allows reasonably sized reflectors to exhibit the very desirable highly directional response for both receiving and transmitting.

Grid Antenna

Used for 2.4 GHz applications. Due to the large size, the grid design minimizes weight and windloading.